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STERILITY.¹

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THE study of sterility, even more than most aspects of medicine, is not an absolute science, but relative—relative as to the degree in which lowered fertility prevents conception and relative as to the amount of blame to be attached to each partner. It is important to stress from the outset that conception depends on a partnership, and to approach the diagnosis in every case with that fact well in mind. It is my experience that the male partner is the cause of the sterile marriage in approximately 25% of cases—a figure somewhat lower than is sometimes stated.

The figures quoted in this paper follow a review of 740 cases of sterility, mostly investigated at the Women's Hospital, Crown Street, Sydney. The average period of sterility is five or six years, and I do not carry out an investigation for a couple who have been "trying" for less than one year.

It is not the purpose of this paper to offer a classical symposium on sterility in text-book style, but rather to indicate a practical method of approach to this problem easily available to any practitioner with access to even small district hospital facilities. While it is desirable for a "sterility clinic" to be conducted at a large centre, it is equally desirable for the general practitioner to have some insight into what takes place there, in order that he may have an intelligent appreciation of reports submitted back

to him. Cases of absolute sterility are easily pigeon-holed, such as (i) occlusion of the Fallopian tubes in the woman and (ii) azoospermia in the male; but we must carefully examine each minor fault in the partnership when it comes to the more difficult border-line cases. I think these faults have been aptly termed "infertility factors", and it is a summation of these that very often causes the sterility. As I intend to spend only a short time discussing the male partner, perhaps we should take that aspect first—a procedure I usually follow in routine investigations.

MALE STERILITY.

Collection of the Specimen of Semen.

An analysis of the semen gives us most of our information on the subject of male sterility. After experience of various methods of collection of the specimen, I have come to the conclusion that a wide-mouth jar to receive the ejaculate direct by *coitus interruptus* is the most satisfactory. A four-day period of abstinence is advised previously, and the patient is asked to present the specimen within three hours if possible. The use of a rubber condom interferes with the viability of the spermatozoa. In order to prove this, 186 specimens were collected in condoms, and 46% were motile. Of 210 specimens collected by the direct method, 80% were motile—more than half of them for at least twenty-four hours.

Volume and Motility of the Specimen.

The volume of the specimen is first measured; in my experience this should be between two and three cubic centimetres. Motility is noted on receipt of the specimen and recorded as "percentage motility". It would be desirable to examine the specimen at hourly intervals and to plot a viability curve, but this is rather time-consuming in busy departments. At this clinic we examine the specimen twice in twenty-four hours. Between examinations specimens may be left at room temperature or preferably in a refrigerator at approximately 4° C. If they are kept

¹ Read at a meeting of the New South Wales Branch of the British Medical Association on October 12, 1944.

at room temperature, bacterial growth may tend to reduce viability. If they are kept at a low temperature, they must be warmed slowly to body temperature before reexamination. The period of viability of spermatozoa in the vagina is a maximum of three hours (Weisman).¹⁰ Therefore we are now estimating the survival of spermatozoa at body temperature and in lactic acid at about pH 5. We have found that even grossly abnormal spermatozoa may be freely motile, so motility is not a true criterion of fertility and must be read only in conjunction with other factors.

Density of Sperm Population.

To estimate the density of the sperm population, "Chloramine T" (1%) is used as a diluent, and the count is made as for blood. We have found dilutions of one in five to one in forty to be the most suitable, a rough guide being the wet film made when the specimen is being examined for motility. One hundred million sperms per cubic centimetre are regarded as the requirement. In specimens of low density it is difficult because of the viscosity to count the sperms undiluted. In making dilutions we use pipettes graduated to 0.01 cubic centimetre, deliver the specimen into the test tube and add the diluent, preferably using one cubic centimetre of the specimen with a suitable quantity of diluent. As an alternative diluting fluid, sodium bicarbonate (5%) with formalin (1%) may be used.

Viscosity of the Specimen.

Normal specimens should liquefy within three or four hours. We have noted that specimens of high viscosity usually have high sperm counts.

Hydrogen Ion Concentration of the Specimen.

No marked variation in pH was noted in normal or abnormal specimens; it was approximately pH 8. We do not consider this an important estimation.

Morphological Examination of the Specimen.

Three reagents are used. The first is Mayer's acid hæmatoxylin aluminium, which is prepared as follows:

Dissolve three grammes of hæmatoxylin in 700 cubic centimetres of distilled water. Add 50 grammes of aluminium ammonium sulphate, and when dissolved add 0.3 gramme of sodium iodate. Allow to stand overnight, and then add 300 cubic centimetres of neutral glycerin and 20 cubic centimetres of glacial acetic acid. Filter.

We have tried various hæmatoxylin stains, but find that this has the advantage that it can be used immediately after preparation. The second reagent is 1% alcoholic eosin, and the third is a bluing solution, consisting of 3.5 grammes of sodium bicarbonate and 20 grammes of magnesium sulphate to one litre.

Method.

The method is as follows.

Make smears as for blood. Dry them at room temperature or in the incubator. Fix in methyl alcohol for two minutes. Wash in water, stain in hæmatoxylin for five to ten minutes. Wash in water; blue in bluing solution; wash. Stain in eosin for half a minute. Wash, dry and examine the smears.

To examine the smears, count 200 spermatozoa, differentiating the abnormal forms into (i) abnormal head forms, (ii) abnormal middle pieces, (iii) abnormal tails and (iv) sperms showing more than one abnormality.

The Possible Findings.

The percentage of abnormal forms is the most important single factor in assaying the fertility of the semen. I have found that a better diagnosis can be made by subdividing them as above, and I regard the abnormal head forms as the most important. The middle pieces are not of much importance, and the tails are important only when they are lacking, because of the loss of motility. All factors of a specimen must be taken into consideration when the fertility is being assessed, but I regard 25% of abnormal forms as about the limit of normality. Immature

forms are rare in fertile semen. In subfertile semen they are usually abnormal as well as immature.

Azoospermia.—If no spermatozoa are seen in the wet film, centrifuge the entire specimen and examine the deposit, after staining as before. Many granules are usually seen in azoospermia, also bodies containing no nuclear material, the significance of which is not clear. These granules are also encountered in specimens having generally poor characteristics. If azoospermia is present, further specimens should be examined to confirm the diagnosis.

Crystals.—Crystals, usually phosphates, are a sign of lowered fertility in a fresh specimen, as distinct from a sample which has stood for some time. They tend to be precipitated, especially in the refrigerator.

Cells and Organisms.—Cells and organisms—especially pus cells—are not of direct import in themselves, but provide evidence of inflammatory changes in the genital tract.

In semen of lowered fertility, it is rare to find one abnormality alone, and a complete picture of the specimen must be kept in mind when an attempt is made to give a prognosis.

Results.

In the 700 cases considered in this paper, azoospermia was present in 8% and 8% of specimens were practically infertile. The latter specimens were of low volume, contained over 40% of abnormal forms, were of decreased viability and had a low sperm count per cubic centimetre.

It is unnecessary to stress the importance of these findings when one is considering the haphazard treatment of sterility in a woman with proprietary endocrine preparations and without adequate investigation. I have recently seen two women in whose cases major (and expensive) surgical intervention had failed because the husbands had azoospermia.

Cause of Male Sterility.

The cause of male sterility is often difficult to find, but the popular conception that mumps is a causative agent seems to be justified, especially if the attack occurs about puberty, at the time of maturation of the seminiferous tubules. Malaria under treatment by "Atebrin" or quinine and sulphonamide therapy is sometimes blamed for lowering of fertility at the present time; but I imagine that any sterility in the malaria cases at least is due to general constitutional debility rather than to any specific cause.

It is not my place here to discuss disturbances of the male reproductive system, but in cases of obvious subfertility investigation by a urologist is indicated.

Testicular Biopsy.

Dr. A. Telfer has worked in conjunction with me on the subject of testicular biopsy and has kindly submitted reports from Sydney Hospital. In his opinion testicular biopsy is essential in these cases for a full knowledge of male infertility. In a personal communication he states that the biopsy findings may be divided into three types: (i) normal spermatogenesis, (ii) disordered spermatogenesis, (iii) no spermatogenesis. If spermatogenesis is normal, the urologist must search for some obstruction in the seminal channels. When disordered or no spermatogenesis is found the cause may be sought in (i) general health, (ii) endocrine disorders, (iii) inflammatory changes to the seminiferous tubules (for example, after mumps in adults), (iv) damage to the seminiferous tubules after exposure to chemical toxins, (v) arteriolar damage causing atrophy. When spermatogenesis is at fault Dr. Telfer divides the patients into two classes: (a) those who have complete atrophy of the seminiferous tubules; with these nothing can be done; (b) those who have disordered spermatogenesis; spermatogenesis may not have progressed past the spermatid or spermatocyte stage; it is in these cases that one may hope to stimulate activity by general health measures and endocrine therapy.

Treatment of Male Sterility.

The effectiveness of any treatment of male sterility must be controlled by repeated semen analyses. General hygienic and dietary measures should include especially the exhibition of vitamin B complex and vitamin E. These vitamins seem to have an effect on spermatogenesis.⁽²⁾ Adequate rest and recreation should be provided, with a holiday when necessary. I am sure that overwork and undue fatigue produce many a poor specimen of semen. Iron is necessary in the case of anaemia. Thyroid extract is given partly empirically, but would seem sometimes to improve spermatogenesis. Excessive coitus should be avoided. I have had some successes in cases in which coitus was limited, as far as practicable, to the twelfth to fourteenth days of the wife's menstrual cycle—that is, to the approximate time of ovulation. Adequate coitus is, of course, necessary, and unless they are specifically questioned about it some couples seem to imagine that once in six weeks or so is normal. This will probably call for appropriate treatment.

Gonadotropic Hormones.

My practical experience of gonadotropic hormones is with "Serogan" and "Antuitrin S". The former I have found to give the best results, as it directly stimulates the germinal epithelium of the testis, leading to more active spermatogenesis. Two hundred units of "Serogan" are given twice a week for six weeks; after a month's rest this course is repeated. Morphological examination then reveals improvement in many specimens. "Antuitrin S" is mainly used as a prophylactic in younger patients with undescended testes—a condition which greatly lowers spermatogenesis.

Androgenic Hormones.

Androgenic hormones are especially useful when impotence or infrequent coitus are factors. The administration of all hormones would best be scientifically correlated with assays of excretion of gonadotropic hormone.

Dyskyesis.

In my opinion many cases of spontaneous miscarriage are due to subfertile semen, which is adequate for conception, but not for the normal development of the ovum. Probably this is due to deficient excretion of chorionic hormone. Consequently all pregnancies resulting from semen known to be "below par" should be safeguarded by prophylactic therapy up to four months. I have found "Antuitrin S (Forte)", one cubic centimetre (500 units) being given twice a week, the most successful injection, together with the exhibition of vitamin E.

FEMALE STERILITY.

The study of sterility in the male is a positive investigation, but the study of that in the female is negative only, as we cannot procure actual proof of fertility except by conception. All we can do is to eliminate causes of infertility; we are left with many puzzling cases, in which pregnancy should occur but does not. As our methods of investigation become more complete, this series should become progressively smaller.

A full history is important in every case, and attention should be paid to frigidity and dyspareunia. It should be ascertained that adequate sexual intercourse takes place, particularly about the estimated time of ovulation.

The further investigations may be summarized under three headings: (i) clinical examination, (ii) investigation of the patency of the Fallopian tubes, (iii) ovulation. It would also be desirable, but not always practicable, to ascertain the pH of the vagina and to carry out biological assays of gonadotropic hormone excretion.

Clinical Examination.

The clinical examination should include a general examination and a careful gynecological survey—especially with reference to infections of the genital tract, mal-

positions or abnormalities, and evidence of endocrine disturbances.

General ill-health and debility or anaemia are important factors. A depressed thyroid state often produces sterility. Oligomenorrhoea is the rule, but menorrhagia may be present. An increase of body weight and a negative basal metabolic rate are noted. The vaginal examination should detect septa of the vagina and other gross abnormalities. Erosion of the cervix should be looked for.

An infantile uterus is distinguished by the fact that the cervix is two-thirds the length and the body one-third—the opposite to the normal. It is wise to be careful about saying that it is "impossible to become pregnant" on this account, as the words are often quoted when pregnancy does occur.

A hypoplastic uterus usually indicates lowered ovarian activity, but these patients will not usually respond to oestrin therapy alone, possibly because, as has been shown in rodents, ovarian hormone is incapable of affecting the genital organs until their differentiation has attained a certain level.

Patency of the Fallopian Tubes.

The patency of the Fallopian tubes may be investigated by three methods.

Rubin's Test.

Rubin's test, with auscultation over the lower abdominal quadrants, is carried out in its simplest form by an ordinary sphygmomanometer with rolled-up sleeve. The test only shows whether the tubes are "blocked" or "open", and can yield no further information; hence I have practically discarded it in favour of the two following methods.

Kymography.

The second method is the making of kymographic tracings on a revolving "smoked" drum. Owing to war conditions of imports, I have been compelled to design my own elementary form of this instrument with a geared gramophone motor and mercury manometer; but the tracings are fairly accurate and yield a permanent record of each case. Air is pumped into the uterus up to a pressure of 200 millimetres of mercury, the main difficulty being to ensure a gas-tight joint at the external os. "Shoulder pain" described by some observers has been conspicuously absent in most cases of my series. Four characteristic graphs are recognizable. (i) tubes patent—when the needle cannot be maintained at a level; (ii) tubes obstructed—when a straight line results at the 200 millimetres of mercury level; (iii) tubal spasm—when it takes time and a high initial pressure to permeate the tubes, but the air passes easily at a lower pressure later; (iv) tubal stenosis—when the air passes slowly at a comparatively high pressure, and adhesions may be present around the tubes. It goes without saying that leaks in the apparatus must at all times be excluded.

Apart from some nervous disturbances I have encountered no complications, though gas embolism has been described. Serious effects should be extremely rare if simple precautions are observed—such as avoiding excessive air pressure and not carrying out the test in the presence of blood or recent pelvic or vaginal infection. It is my practice to carry out the air insufflation first and follow this immediately with utero-salpingography as described in the next section. The graphs usually coincide with the X-ray findings; but I have a small series in which the tubes were obstructed to air but patent to opaque oil. I consider that this is due to the extra pressure exerted by the oil. By means of a mercury manometer I have tested this theory, and have been amazed to find that oil is often unknowingly injected at a pressure of 400 millimetres of mercury. Possibly also the preliminary air insufflation has some effect in reducing tubal spasm.

Utero-Salpingography.

The third method is utero-salpingography. The female pelvic organs are invisible in ordinary direct X-ray films. The lumen of the hollow portions of the pelvic organs—

namely, the cervical canal, uterine cavity and Fallopian tubes—can be filled with contrast medium, so that the hollow portions are rendered visible to X rays. The contrast medium is usually an iodized oil, which is non-irritant and non-toxic. I use "Neo-hydriol" or "Iodatoil". In this manner, the shape and position of the uterine cavity, and the length, shape and position of the Fallopian tubes, can be ascertained. The method will indicate whether one or both tubes are patent, or if obstruction is present, the site of obstruction, thus giving a much fuller picture of the condition than any air insufflation tests. This is particularly important when salpingostomy is to be considered.

Contraindications.—Contraindications to utero-salpingography are the presence of an intrauterine pregnancy, menstruation and the immediate premenstrual and post-menstrual period, active infection of the cervix or tubes, obvious hydrosalpinx or pyosalpinx, and ectopic gestation. A profuse vaginal discharge should be cleared up before one proceeds with the X-ray examination. A careful clinical examination is therefore an essential preliminary to utero-salpingography. It is wise to allow the uterine endometrium seven days to be restored after menstruation, and for intercourse to be prohibited during this same seven days.

Technique.—The technique is as follows. Except in rare cases anaesthesia is unnecessary. Two main points are to be remembered—firstly, to use an introducer with an "acorn" which will adequately close the cervix (I prefer an all-metal introducer), and secondly, to grasp the cervix with a volsellum and hold it down during the injection and during the taking of the picture. This keeps the uterine cavity well filled and prevents a confusing collection of oil in the vagina. The radiographic technique will demonstrate the outline of the uterine cavity, but the outline of the lumen of the Fallopian tubes depends upon the conditions present. There may be a spasm of the cornual sphincters, in which case the tubes will not be filled; but in cases of doubtful patency, the most important X-ray information is obtained twelve, twenty-four or forty-eight hours after the injection of the opaque medium. If one or both tubes are patent, the second X-ray film will reveal free oil in the peritoneal cavity smeared in a wave-like manner over the coils of intestine in the pelvis. This is proof positive of patency, irrespective of whether the tubes were outlined or not at the original examination just after injection. Droplets of oil seen outside a Fallopian tube indicate patency; but if in the second film they have failed to spread over the intestines in the characteristic manner, the probable existence of a walled-in peritoneal pocket adjacent to the fimbriated end of the tube must be considered. Droplets of oil within a Fallopian tube indicate a hydrosalpinx, giving the droplet effect of "oil in water". The second film will reveal an unchanged appearance of the oil droplets, or a coalescence into a solitary collection of opaque oil. Ante flexion or retro flexion of the uterus may be demonstrated by a lateral X-ray projection as confirmation of the clinical findings. Congenital abnormalities of the uterus are well shown, such as the infantile or bicornuate types, or a double uterus. Sub-mucous fibroid growth or carcinoma may be shown as a filling defect of the uterine cavity; the former is usually smooth in contour, whereas the latter may be irregular in outline. Early pregnancy may simulate one or other of these filling defects; but, as this is a contraindication to the examination, it should be excluded by clinical means if it is possible to do so. The presence of an early pregnancy tends to close the Fallopian tubes at the cornua. Strangely, I have twice in error injected oil into a uterus with an early pregnancy without disturbing it. Ovarian cysts, dermoid cysts and pedunculated fibromata may displace the uterus and may elevate, elongate and distort the Fallopian tube on the side of the tumour. If the tubes are patent, the free oil which remains in the peritoneal cavity is gradually absorbed. An excess of oil should therefore be avoided by limiting the quantity injected to five or six cubic centimetres only. An excess of oil may produce local pelvic irritation, or if an unsuspected low-grade cervical or tubal infection is present, infection

may be introduced into the peritoneal cavity by the excess of oil and thus produce a local pelvic peritonitis. Sometimes the apparent failure of the oil to fill or pass through the tubes may be due to insufficient oil or to too low a pressure of injection; hence it is wise for an inexperienced operator, after injecting five cubic centimetres, to develop and look at a plate before removing the intrauterine cannula. Further oil or further pressure may be necessary. To save expense, the initial picture is sometimes omitted; but I do not approve of this procedure, as it may lead to many erroneous conclusions. The relation of oil residue to the uterus or tubes is unknown, as is the uterine contour and whether one or both tubes are filled. Also it cannot be known positively whether the uterine cavity was completely filled with oil, as the pain reactions of patients vary considerably. I prefer to leave the second film—that intended to show peritoneal "spill"—till about three days later, as uterine residues can be confusing. When time in a clinic is being conserved, it is sometimes the practice to carry out X-ray and biopsy examinations on the same day, and it was my custom to make the latter first. This led to severe lower abdominal pain in several cases, due, I think, to the forcing of blood from the damaged endometrium into the peritoneal cavity. Since I have reversed the procedures, this has been eliminated.

Complications.—A fair amount of pain is usually experienced in the lower part of the abdomen; this takes some hours to pass off. Shock is occasionally present, especially in those cases in which the tubes are patent and considerable intraperitoneal spill occurs. I have had two cases of pelvic peritonitis, both of which subsided with conservative treatment and two weeks in hospital; in one of these a posterior colpotomy was needed.

Results.—The results of utero-salpingography in this series of cases showed that in 33% occlusion of tubes was present and there was no intraperitoneal spill.

Ovulation.

Indications of anovular menstruation are often found in an irregular menstrual history, especially with short cycles; but it may occur with normal cycles. There are sometimes signs of adrenal or pituitary dysfunction—for example, the male type.

In practice endometrial biopsy is carried out during the week prior to menstruation, and evidence of secretory endometrium may be taken to prove that ovulation has taken place. A check with the actual date when menstruation occurs should be made, especially when the cycles are difficult to estimate. In very irregular menstruation and periods of amenorrhœa biopsies must be made at intervals until one immediately preceding menstruation is obtained.

The biopsy curette I find most suitable is similar to the one introduced by Shannon and Sheehan. It is not much larger than a uterine sound and has a hollow tubular end beyond the cutting edge, with a chamber into which the piece of endometrium slides, and in which it remains while the curette is withdrawn. Agitation in a 10% solution of formalin in saline solution will cause the specimen to drop out. Anaesthesia is rarely necessary. By trial I have found that the best specimens are obtained in the mid-line of the anterior and posterior uterine walls. The specimens are dropped into the 10% formal-saline solution as a fixative, and sections are cut in the usual way and stained with hæmatoxylin and eosin.

Secretory endometrium is characterized by (i) convolution of the glands, resulting in tuft-like protrusions into the lumina, (ii) a change from low cuboidal epithelium lining the glands to tall columnar cells, which later become pale with frayed edges as their contained secretion is released, and (iii) changes in the stroma, seen when the secretory phase is well advanced—the stroma becoming oedematous and less dense and the individual cells large and pale. Non-secretory endometrium is diagnosed by a lack of the above findings in the premenstrual period. Anovular menstruation occurred in 5% of patients in this series.

I consider that these findings should be confirmed by more than one biopsy, because of the possibility that cycles of anovular menstruation may occur in a normal woman. These are more likely to occur at the beginning and end of her menstrual life.

In a small series of our cases the endometrium is incompletely differentiated, both proliferative and secretory phases being present in the one specimen. This condition has been shown (Mason, 1937) to be a predisposing factor to miscarriage, and "Antultrin S" should be administered as a prophylactic as soon as pregnancy occurs. In one case only in a series of 200 biopsies has endometrial tuberculosis been found, secondary to tuberculosis of the Fallopian tubes; this figure is much lower than that recently published by Sharman in England.⁽¹⁾ Possibly it should be raised slightly, as many patients with the absolute infertility factor of occlusion of the Fallopian tubes did not proceed to biopsy investigation.

Treatment of Female Sterility.

In the treatment of female sterility, general health measures should be adopted, with the elimination of septic foci, the treatment of anaemia and any steps necessary to raise the general tone of the body. An adequate and generous diet should contain extra vitamin E, especially when a liability to miscarriage is present. As a slight deficiency of thyroidal secretion seems to be often associated with sterility, thyroid extract may be prescribed in small doses.

It has been shown experimentally⁽²⁾ that spermatozoa in glucose-free medium lose their motility rapidly; therefore in mild cases of sterility it is my practice to advise a pre-coital douche of Ringer-glucose solution. This follows MacLeod and Hotchkiss.⁽³⁾ The solution is made as follows: sodium chloride 9.0 grammes, potassium chloride 0.23 gramme, calcium chloride 0.22 gramme, glucose (c.p.) 20 grammes. Make into a powder. Half an ounce to a pint of warm water.

Endocrine Preparations.

The ovarian secretion may be stimulated by gonadotropic hormones, or the oestrogenic hormones may be used as a general reproductive stimulant. These measures are especially useful to correct irregular menstruation or temporary amenorrhoea. Dosage must be individual and adjusted to each patient according to the effects produced; but as a guide, it is my preference to use "Cestroform" (British Drug Houses) and inject 50,000 international units twice a week for the two weeks immediately following the cessation of the menstrual flow. It is my custom to repeat this treatment for at least four months. Of the effect of oestrin on occluded Fallopian tubes I am sceptical.

Anovular Menstruation.

In my opinion there is small hope of curing anovular menstruation; but it is my practice to use the serum gonadotropic hormone, "Serogan", four injections of 1,000 international units being administered during the ten days following cessation of the menstrual flow and repeated for six months. In one case of non-ovulation confirmed by several biopsies a live infant was produced after this treatment.

Surgical Measures.

Insufflation of the Fallopian tubes and X-ray examination after lipiodol instillation have a pronounced therapeutic effect, and many patients with established sterility become pregnant immediately afterwards. Probably this is due to the breaking down of filmy adhesions, and if the procedure is carried out at intervals it may improve the patency of the tubes.

Retroversion of the uterus is important, more because of kinking of the tubes and prolapse with congestion of the ovaries than because of the actual displacement. It is rarely necessary to operate except when the uterus is fixed back with adhesions. Tubal patency is easily tested

at the time of section by inflation through the fimbriated end with a ten cubic centimetre syringe.

Myomectomy is indicated especially if there is an obstruction of the tubal opening into the uterus. It is often necessary to correct an ovarian dysfunction present in these cases and possibly causing the fibroid growths.

The results of salpingostomy are poor. Greenhill, in an American survey, found only 6% of pregnancies to follow this procedure. Even when patency of the tubes is restored, as indicated by X-ray examination with lipiodol, pregnancy often does not occur. Probably some degree of hydrosalpinx is present which destroys the cilia of the lumen and interferes with the normal muscular tubal contractions necessary to facilitate the passage of the ovum.

I have a patient or two with restored patency of the tubes, but I have never yet had a case in which pregnancy followed. I have performed very few such operations; I limit these to occlusions at the fimbriated ends. Of more radical surgical procedures, such as tubo-uterine implantation and intrauterine transplantations of the ovary, I have no personal experience.

Artificial Insemination.

I have limited artificial insemination to cases in which the husband is the donor. The procedure is easily carried out with a ten cubic centimetre syringe and a cervical introducer. It would seem reasonable to choose the time of ovulation for the operation, and most chance of success is with a fairly normal semen in which lack of motility of the sperms is the main defect.

Miscarriage.

As mentioned elsewhere, patients who become pregnant with subfertile semen should be safeguarded with injections of "Antultrin S" and given vitamin E. In cases of habitual abortion I have a semen analysis and a Wassermann test made. The Rh status of both partners is also determined, as this factor is probably the causative agent in some cases. Thyroid extract is also sometimes of use.

PROGNOSIS.

During the last twelve months I have fully investigated 250 cases of sterility among private patients. My follow-up records are more complete for these than for hospital patients, so I have chosen them as a guide to prognosis. Pregnancy has resulted in 24%.

If we exclude the more hopeless conditions (in this series these are represented by azoospermia 8%, occluded Fallopian tubes 25% and anovular menstruation 3%), we are left with milder deficiencies in 64% of patients. These are the patients who are likely to benefit by treatment, and pregnancy has resulted in 38%.

These are minimal figures for prognosis, as some of the investigations have been completed only within the last few months, and during the next year many of these women are expected to become pregnant.

When a hopeless prognosis is given, I feel that some degree of psychic trauma often results, and I invariably encourage and facilitate the adoption of a baby. Many of these infertile couples have followed the advice, with happy results.

SUMMARY.

1. Methods of a complete investigation for sterility are outlined. It is stressed that the condition is often due to a summation of "infertility factors" rather than to the fault of one partner alone, and a review is given of over 700 cases investigated at the Women's Hospital, Crown Street, Sydney.

2. The male factor was apparently the absolute causative agent in 16% of this series of cases. This included 8% in which seminal analysis revealed azoospermia and 8% in which there were enough abnormal changes in the semen to make it practically infertile. Taking into account all infertility factors, I believe that the male is responsible for 25% of childless marriages.

3. The female element seems to have been wholly responsible in 38% of cases. This includes 33% in which there

was complete occlusion of the Fallopian tubes (confirmed by salpingographs with an opaque oil), and 5% in which endometrial biopsies revealed anovular menstruation.

4. In 46% of these cases of sterility both partners had minor faults in varying degrees, the female faults predominating. These were usually due to glandular dysfunctions, and it is in this range of patients that the greatest successes have been obtained after the exhibition of appropriate endocrine preparations. It has been shown that one may expect upwards of 40% of these patients to succeed in becoming pregnant.

5. As a treatise on sterility this paper is necessarily incomplete, but an attempt has been made to indicate a practical and easily available approach to the problem. This should include a semen analysis, and if subfertility is present a testicular biopsy for the husband. For the wife a complete clinical and gynaecological examination is necessary, followed by an opaque oil X-ray examination of her Fallopian tubes and an endometrial biopsy.

ACKNOWLEDGEMENTS.

It would be absolutely impossible to conduct an investigation into sterility without the close and friendly cooperation of the X-ray and pathological departments. For this reason my thanks are at all times due to Dr. G. Maitland of the former and to Dr. Jean Collier of the latter department, and to our technician, Mr. M. Frost. Dr. Maitland and Dr. Collier are largely responsible for the illustrations. I should also like to record that a lot of the early work on sterility at the Women's Hospital, Crown Street, Sydney, was done by Dr. A. Grant, who is at present with the Australian Imperial Force.

REFERENCES.

- ⁽¹⁾ A. I. Weisman: "Spermatozoa and Sterility."
- ⁽²⁾ M. S. Biskind and H. C. Falk: "Nutritional Therapy of Infertility in Male, with Special Reference to Vitamin B Complex and Vitamin E", *The Journal of Clinical Endocrinology*, Volume III, March, 1943, page 148.
- ⁽³⁾ A. Sharman: "Some Recent Studies and Investigations in Sterility", *The Journal of Obstetrics and Gynaecology of the British Empire*, Volume LI, 1944, page 85.
- ⁽⁴⁾ J. MacLeod: "Relation between Metabolism and Motility of Human Spermatozoa", *Human Fertility*, Volume VII, October, 1942, page 129.
- ⁽⁵⁾ J. MacLeod and R. S. Hotchkiss: "Use of Precoital Douche in Cases of Infertility of Long Duration", *American Journal of Obstetrics and Gynaecology*, Volume XLVI, September, 1943, page 424.

EFFORT AND RESULT IN STERILITY: AN AUDIT OF 407 CASES.

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THE purpose of this paper is to present an audit of 74 patients who became pregnant after treatment at a sterility clinic, and to indicate what were the causes of the sterility, the treatment given, and the ultimate course of their pregnancy and labour. Simultaneously I should like to include some comments on the subject of sterility in general, based on the experience gained in treating many patients who attended the sterility clinic at the Women's Hospital, Crown Street, Sydney, from 1938 to 1942.

The Multiplicity of Sterility or Infertility Factors.

In the investigation of the average married couple suffering from sterility it will be found that one infertility factor is not operating alone, but that there are a number of them, of which one will usually be paramount. It is important to grasp this basic concept of sterility investigation at the outset.

The Prevalence of Sterility.

It has been estimated recently by Mander⁽¹⁾ that 20% of modern marriages in Australia are childless. Of these childless marriages slightly more than half are childless "late" marriages, in which the women are over thirty years of age; slightly less than half occur among women who have married under the age of thirty years. These figures are computed from statistics taken from the "Official Year Book of the Commonwealth of Australia". A committee of British investigators in 1943⁽²⁾ computed that about 10% of marriages in Great Britain remain childless, and furthermore gave it as their opinion that "permanent childlessness is rarely deliberate". These figures represent the magnitude of the problem that the State has a right to expect the medical profession to solve in the near future. In the present state of our knowledge gynaecologists should be able to cure at least one-third of these patients by employing adequate effort and the proper methods of investigation and treatment.

The Investigation of Sterility in the Male.

The minimum facts that should be known about a specimen of seminal fluid are as follows.

The first is the volume. The second is the total spermatozoa count. It is essential to know the minimum number of spermatozoa present per cubic centimetre. This is estimated with the aid of a haemocytometer chamber after dilution with "Chloramine T". The third essential is a differential sperm count. This means the estimation of the percentage of sperms present that have morphological abnormalities of their heads or tails. It is found by making a thin smear and fixing it with methyl alcohol and then staining it in a special manner. The method that I have used is that suggested to us by Dr. Gunn, of the School of Veterinary Science at the University of Sydney, and used by him for his well-known work on sheep. The fourth observation is motility; this is determined in a fresh specimen.

The hydrogen ion concentration can be disregarded. The time has passed when it was sufficient to collect a specimen, look at it under a microscope, and pronounce a verdict as to the fertility of the donor, because motility is not synonymous with fertility, and abnormal spermatozoa can be quite motile.

Method of Collecting Specimens.

The best method of collecting specimens is by masturbation; but the idea is revolting to the average Australian. Overseas authors describe it without an emotional inflection, but most of our patients scorned it. The next best method is to collect the ejaculate into a clean, wide-mouthed jar. A method we used extensively in the early stages was the condom and test tube technique. By this method the male collected the specimen in a condom and immediately after intercourse transferred its contents into a clean, well-washed test tube free from alkali. The patient must be warned to leave the specimen at room temperature and not to try to warm it. The condom technique alone is not satisfactory, as spermatozoa die quickly if left in these rubber collectors. The condoms can be detoxicated, but it is better to dispense with them altogether.

The Criteria of Normality.

The following are the minimum requirements for normality.

A volume below one cubic centimetre is abnormal. A total count of less than 50,000,000 spermatozoa per cubic centimetre is unsatisfactory and subnormal, providing that other abnormalities also are present. If over 20% of the spermatozoa are of abnormal forms, the specimen is subnormal. An increasing percentage of abnormal sperms is progressively bad. In a normal sample about 70% to 80% of the spermatozoa should be motile if the specimen has been collected and transported properly. If there is no motility, be wary of jumping to conclusions, and repeat the test while looking for associated morphological deformities.

The Need for Repeated Examinations.

It is a wise precaution never to be satisfied with a single fertility assay on any specimen of semen that appears to be unsatisfactory at the first examination. The diagnosis of male infertility is statistical, and a single poor count is merely a strong pointer. By itself it is not an incontrovertible indictment of male fertility, especially in border-line cases. In any group of cases it will be found that the truth is represented by a sliding scale, and the more that a sperm count deviates from these basal figures, the greater will be the percentage incidence of infertility.

Deficient Sperm Counts.

Absence of spermatozoa calls for a testicular biopsy to see if spermatogenesis is normal. If it is, we may assume that there is a block in the ejaculatory mechanism. In the case of patients who have sperms in the specimen, but whose sperm counts are subnormal, the cause will usually be found to be constitutional and not local. Often a defective count is associated with excessive sedentary work, focal sepsis *et cetera*. If no organic disorder is discovered, the patient should be sent for a holiday in the open air, as this is more enjoyable than a course of hormone therapy and much less expensive, and in our cases it proved effective.

The Results of Investigation in the Male.

In our series of cases it was found that a little over 10% of the males examined had no sperms in their ejaculate, or else had a negligible number. The quantity of seminal fluid that these men bring for examination is often large, all composed of secretions. The incidence of males who had subnormal sperm counts varied from 10% to 15%, according to the group of 100 cases on which the figures were based.

The lesson is that in any group of married couples suffering from childlessness, there is probably one family in every five in which the fault will be found on the male side. With regard to the treatment of males whose ejaculate contains sperms, but in unsatisfactory numbers, I should like again to stress the fact that holidays are to be tried before hormones.

Investigation and Treatment of Sterility in the Female.

In a previous paper published in this journal⁽¹⁾ I indicated the scheme used in investigating the female, so it will suffice to confine the present remarks to generalities born of experience.

Fluid versus Gas Tests for Tubal Patency.

In the present series the incidence of blocked Fallopian tubes was about 25%. Once a clinician has declared himself for or against gas or opaque media for the investigation of tubal patency, it is a strenuous task to persuade him otherwise. Most of these patients were investigated with lipiodol, "Neo-Hydriol" (a less viscous oil) or "Perabrodil" diluted with gum-acacia. The last-mentioned medium overcomes the fear that oil may be injected into the uterine veins. It is the opinion of the staff at the hospital that this danger has been overstressed in the literature. It is probably wisest to use gas first, and then to resort to some opaque medium if there is not an easy flow of gas at low pressure through the tubes. "Oil often passes when gas will not". The best time for these tests is the mid-menstrual interval, when the mucosa of the tubes and uterus is not swollen and oedematous as it is in the pre-menstrual phase.

Premenstrual Biopsy.

The taking of a biopsy specimen may be carried out with safety in the surgery or out-patient department under local anaesthesia. The endometrial tissue should be removed from the anterior or posterior wall of the uterus high up, as it is there that the maximal cytological changes will be found. These fragments may be removed in the first four hours of the menstrual flow in the case of patients

who have an irregular onset of the menses. A description of the changes to be looked for may be found in any standard text-book.

From the microscopic appearance of the endometrium it is possible to say whether the patient has ovulated or not. In this series the incidence of anovulation was about 6%. In a large series of cases in the United States of America, Rock⁽²⁾ found that about 4% of patients were habitually anovular, and that about 9% of sterile patients exhibited occasional anovulatory menstruation. The patient who suffers from anovulation has a discharge *per vaginam* each month like her normal sisters, but usually the menses are irregular in onset. Regular menstruation usually means ovular menstruation. The examination of endometrial biopsies is therefore urgent if a patient suffering from sterility is not menstruating at regular intervals. Apparently "attacks" of anovulatory menstruation are not uncommon in the human female. Working in an army women's hospital we find that functional uterine bleeding is a common complaint amongst patients presenting themselves for admission, and in many cases it is associated with anovulation as judged from the cytological pattern of the endometrium removed from the uterus just prior to an expected period.

The Treatment of Blocked Fallopian Tubes.

The surgical treatment of Fallopian tubes blocked at their fimbriated ends has not yielded more than about one pregnancy for every fifteen operations, and of these about one-third will end in miscarriage or ectopic gestations (Greenhill).

I think that more extensive use should be made of repeated insufflations or oil injections, either alone or with the additional therapy advocated by Moore-White of the Royal Free Hospital, London.⁽³⁾ In this *régime* five milligrammes of oestradiol benzoate are injected every five days for five injections, and the Fallopian tubes are then reinjected with an opaque medium. In a small series of forty patients treated by this method one-third had some degree of patency after the treatment, and about half of them are known to have become pregnant.

The Treatment of Anovulation.

There appear to be two types of anovulation, one of which is permanent and the other transitory. In assessing the value of apparently successful treatment, one must always be suspicious that he is dealing with a case in which spontaneous cure not due to the medication provided has occurred. The only preparation for which any success at all can be claimed is serum gonadotropic hormone. I have used this subcutaneously and intravenously, but with doubtful success. Those patients who did commence to ovulate may have done so with the natural effluxion of time.

The Treatment of other Infertility Factors.

Genital hypoplasia is common, and may be treated by curettage, which seems to have a stimulating effect in promoting growth; or the oestrogenic hormones may be tried. The exigencies of army life make it impossible for me to have access to my statistical records on hypoplasia until some future (post-war) date.

Chronic cervicitis is common in sterile patients, and its treatment by linear cauterization yields highly satisfactory results. The unexplained feature about this lesion is that one finds it present in many successful *multipara* who are not harassed by sterility.

The general health of the patient is of the utmost importance, and diseases such as anaemia, vitamin deficiency conditions and subglandular states should be treated. The role of vitamin E is still undetermined, but it is certainly not a panacea that cures sterility without the trouble of physical examinations, sperm counts and tubal patency tests.

The most useful single glandular preparation is thyroloid extract, and if it is used empirically it will serve the clinician well. The reason for this effectiveness of thyroloid extract is unknown.

TABLE I.
Analysis of Pregnancies.
Total sterility cases, 407; total cases fully investigated, 377; number of patients with reasonable chance of pregnancy, 221.

Clinic Number.	Duration of Sterility.	Kind of Sterility.	Main Causes of Sterility.	Treatment.	Latent Period Before Pregnancy.	Description of Pregnancy.	Description of Labour.	Infant at Birth.
1	3 years.	Primary.	Obstructed tubes.	Repeated Rubin's tests.	6 months.	Hyperemesis.	Normal.	Normal.
8	2 years.	Primary.	Almost imperforate hymen.	Hymenectomy.	6 months.	Normal.	Normal.	Normal.
11	1 year.	Primary.	Uterine hypoplasia.	Dilatation, curettage, thyroid extract.	11 months.	Normal.	Normal.	Normal.
17	6 years.	Primary.	Absence of sperms in male ejaculate.	Extramarital intercourse (not recommended by clinic).	1 month.	Miscarriage at three months.	—	—
25	1-5 years.	Primary.	No abnormality found.	Salpingography.	1 month.	Hyperemesis.	Severe primary inertia.	Normal.
29	"Years."	Secondary.	Cervicitis.	Cauterization of cervix.	5 months.	Miscarriage.	—	—
30	"Years."	Primary.	Uterine hypoplasia.	Dilatation, curettage.	2 months.	Normal.	Normal.	Normal.
31	2 years.	Secondary.	Severe cervicitis.	Cauterization of cervix.	6 months.	Normal.	Normal.	Normal.
35	1-5 years.	Primary.	Obstructed tubes.	Repeated lipiodol tests.	3 months.	Normal.	Normal.	Normal.
47	1-5 years.	Primary.	Severe cervicitis.	Cauterization of cervix.	16 months.	Threatened miscarriage.	Sapremia.	Normal.
49	"Years."	Primary.	Retroversion and dyspareunia.	Internal shortening and cautery to cervix.	6 weeks.	Normal.	Long labour.	Stillborn.
55	4 years.	Secondary.	No abnormality found.	Salpingography and thyroid extract.	3 months.	Toxæmia.	Normal.	Normal.
64	2 years.	Primary.	Cervicitis.	Cautery to cervix.	5 weeks.	Normal.	Normal.	Normal.
76	4 weeks.	Secondary.	Cervicitis.	Cautery to cervix.	3 months.	Placenta prævia.	Cæsarean section.	Normal, living.
66	7 years.	Secondary.	Severe cervicitis.	Cautery to cervix.	1 month.	Normal.	Normal.	Normal.
72	3 years.	Primary.	Fibroid tumour and ovarian cyst.	Myomectomy and removal of cyst.	7 months.	Died at five months from cerebral hemorrhage.	—	—
113	3 years.	Primary.	Obstructed tubes.	Section and freeing of adhesions.	6 weeks.	Miscarriage at three months.	—	—
106	8 years.	Primary.	Retroversion and ovarian cyst.	Internal shortening and removal of cyst.	8 months.	Miscarriage at three months.	—	—
127	2 years.	Secondary.	Obstructed tubes.	Estrogens and repeated Rubin's tests.	3 months.	Normal.	Normal.	Normal.
136	5 years.	Primary.	Uterine hypoplasia.	Curettage and thyroid extract.	2 months.	Miscarriage at two months.	—	—
148	2 years.	Primary.	Retroversion and cervicitis.	Cautery to cervix.	3 months.	Normal.	Normal (epiotomy).	Normal.
154	2 years.	Primary.	Uterine hypoplasia.	Curettage and estrogens.	4 months.	Normal.	Normal.	Normal.
155	2 years.	Primary.	Adhesions following acute appendicitis.	Repeated Rubin's tests.	2 months.	(No record—did not reply to letters.)	—	—
157	2 years.	Primary.	Obstructed tubes.	Repeated Rubin's tests.	5 months.	Hydramnios.	—	Normal, twins.
167	2 years.	Primary.	No abnormality found.	Salpingography.	1 month.	Threatened miscarriage at six months.	Normal.	Normal.
178	3 years.	Secondary.	Old salpingitis.	Repeated Rubin's tests.	3 months.	Normal.	Normal.	Normal.
214	2 years.	Secondary.	Hypothyroid state.	Thyroid extract.	3 months.	Threatened miscarriage at four months.	—	—
224	1-5 years.	Primary.	No abnormality found.	Salpingography.	3 months.	Miscarriage at four months.	—	—
116	2 years.	Primary.	Dysglandular (? pituitary) sterility.	Treated at another hospital.	18 months.	Miscarriage at five months.	—	—
185	2 years.	Secondary.	No abnormality found.	Salpingography.	6 months.	Normal.	Normal (forceps).	Normal.
186	10 years.	Primary.	Anovulation.	Thyroid extract and gonadotropic hormone.	4 months.	Normal.	Normal.	Normal.
222	2 years.	Secondary.	Poorly patent tubes.	Repeated Rubin's tests.	2 months.	Normal.	Normal.	Normal.
225	2 years.	Primary.	Male at fault; subfertile ejaculate.	Holiday for male.	2 months.	Toxæmia.	Normal.	Normal.
242	2 years.	Secondary.	Severe cervicitis.	Cautery to cervix.	4 months.	Normal.	Normal.	Normal.
247	2 years.	Primary.	No abnormality found.	Salpingography and thyroid extract.	2 months.	(Did not reply to letter.)	—	—
250	2 years.	Primary.	Male subfertile; pin-hole cervix.	Focal sepsis in male treated; dilatation of cervix.	2 months.	Miscarriage at three months.	—	—
254	2 years.	Secondary.	Cervicitis, retroversion.	Cautery to cervix.	2 months.	Miscarriage at three months.	—	—
160	2 years.	Primary.	Uterine hypoplasia.	Estrogens.	3 months.	Miscarriage.	—	—
301	5 years.	Primary.	Cervicitis, pin-hole os, et cetera.	Dilatation, cautery to cervix. Repeated Rubin's tests.	12 months.	(No record—did not reply to letter.)	—	—
206	2 years.	Primary.	Poorly patent tubes.	Repeated salpingography.	5 months.	Normal.	Went to country; said to have had a Cæsarean section.	Normal.
213	1 year.	Primary.	No abnormality found.	Salpingography.	3 months.	Normal.	Normal.	Normal.
227	2 years.	Primary.	No abnormality found.	Salpingography.	3 months.	Normal.	Went to another hospital.	Normal.
243	2 years.	Primary.	Vaginismus.	Dilatation; advice to both partners.	4 months.	Normal.	Normal.	Normal.
281	3 years.	Primary.	Poorly patent tubes.	Estrogens and repeated Rubin's tests.	4 months.	Toxæmia.	Normal.	Normal.
290	2 years.	Primary.	Retroversion, cervicitis.	Internal shortening, cautery to cervix.	4 months.	Normal.	Normal.	Normal.
316	1-5 years.	Primary.	Uterine hypoplasia.	Estrogens and curettage.	2 months.	Normal.	Normal.	Normal.
141	2 years.	Primary.	Absence of male sperms.	Extramarital intercourse (not recommended by clinic).	2 months.	Two miscarriages, 1941 and 1942.	—	—
330	1 year.	Primary.	Long cervix with pin-hole os, hypoplasia.	Curettage.	1 month.	Hypertension.	Normal.	Normal.
58	1 year.	Primary.	Retroversion, cervicitis.	Cautery to cervix, insufflation.	14 months.	Ectopic, 1942.	—	—

"Primary sterility" means sterility in a patient who has never conceived.

TABLE I.—Continued.
Analysis of Pregnancies.—Continued.

Total sterility cases, 407; total cases fully investigated, 377; number of patients with reasonable chance of pregnancy, 221.

Clinic Number.	Duration of Sterility.	Kind of Sterility.	Main Causes of Sterility.	Treatment.	Latent Period Before Pregnancy.	Description of Pregnancy.	Description of Labour.	Infant at Birth.
302	2 years.	Primary.	Cervicitis.	Cautery to cervix.	6 months.	Normal.	Normal.	Died during second stage.
318	5 years.	Primary.	Poorly patent tubes.	Estrogens and repeated lipiodol tests.	6 months.	Normal.	Normal.	Normal.
323	2 years.	Primary.	(i) Retroversion, (ii) deficient secretory phase.	—	2 months.	Normal.	Forceps (episiotomy).	Normal.
333	1-5 years.	Primary.	No abnormality found.	Salpingography.	3 weeks.	Normal.	Forceps.	Normal.
338	1 year.	Primary.	No abnormality found.	Passage of sound.	3 months.	No record.	—	—
339	1-5 years.	Primary.	No abnormality found.	Salpingography.	No record.	Hypertension, induction of labour.	Normal.	Premature, lived.
340	1 year.	Primary.	(Records defaced; known to have become pregnant.)	—	No record.	Normal.	Breech.	Normal.
341	1 year.	Primary.	Poorly patent tubes.	Salpingography.	2 months.	Normal.	Normal.	Normal.
348	1 year.	Primary.	Obstructed tubes.	Repeated salpingography.	2 months.	Normal.	Normal.	Normal.
349	2 years.	Secondary.	Male subfertility.	Removal focal sepsis.	3 months.	Miscarriage.	—	—
352	4 years.	Primary.	Male subfertility.	Holiday and thyroid for male.	4 months.	Normal.	Normal.	Normal.
357	4 years.	Primary.	No abnormality found.	Thyroid and salpingography.	5 months.	Normal.	Normal.	Normal.
359	3 years.	Secondary.	(i) Cervicitis, (ii) retroversion.	Cautery to cervix.	3 months.	(No record—did not reply to letter.)	—	—
364	5 years.	Primary.	(i) subfertile male, (ii) lack of sex knowledge.	Advice and thyroid to male.	3 months.	Toxaemia.	Caesarean section; inertia.	Still born; fetal heart sounds stopped suddenly.
374	2 years.	Secondary.	Subfertile male.	Removal of focal sepsis.	3 months.	(No record.)	—	—
382	1-5 years.	Primary.	(i) Subfertile male; (ii) hypoplasia.	(i) Holiday, (ii) dilatation and curette.	3 months.	Threatened miscarriage.	Normal.	Normal.
385	4 years.	Primary.	Subfertile male.	(i) Holiday for husband, (ii) salpingography.	2 months.	Miscarriage at two months.	—	—
387	1-5 years.	Primary.	Subfertile male.	Holiday and thyroid.	4 months.	Normal.	Normal.	Normal.
397	4 years.	Primary.	No abnormality found.	Salpingography.	4 months.	Normal.	Post-partum hemorrhage.	Normal.
39	2 years.	Secondary.	No abnormality found.	Salpingography.	3 months.	Ectopic (operation).	—	—
407	2 years.	Primary.	Dysglandular sterility.	Thyroid.	No record.	Normal.	Normal.	Normal.
101	2 years.	Secondary.	Fibrosis uteri.	Salpingography.	4 months.	Two miscarriages.	—	—
70	11 years.	Primary.	(i) Fibroid tumour; (ii) anovulation.	(i) Myomectomy, (ii) gonadotropin.	6 months.	Threatened miscarriage.	Inertia, episiotomy.	Normal.
196	3 years.	Primary.	Subfertile male.	Husband joined the Australian Imperial Force.	4 months.	Toxaemic.	Normal.	Normal.
199	6 years.	Primary.	Poorly patent tubes.	Estrogens and repeated Rubin's tests.	9 months from start of treatment.	Normal.	Patient went to country.	Normal.

"Primary sterility" means sterility in a patient who has never conceived.

Discussion.

In the statistics that follow I have given the causes of sterility mainly as single entities; but I would again stress the fact that in many cases more than one infertility factor was operating. The one listed is that which was considered the paramount proximal activating cause in each couple investigated.

The following were the commonest causes of sterility in 74 cases in which pregnancy resulted.

No abnormality found (patient became pregnant after lipiodol injection)	14 cases
Obstructed Fallopian tubes	12 cases
Male at fault	11 cases
Chronic cervicitis	9 cases
Chronic cervicitis and retroversion	5 cases
Retroversion and ovarian cyst	1 case
Retroversion	3 cases
Genital hypoplasia	7 cases
Dysglandular sterility (pituitary type)	2 cases
Hypothyroid state	1 case
Anovulation	1 case
Fibroid tumours and anovulation	1 case
Fibroid tumours	1 case
Fibrosis uteri	1 case
Adhesions (pelvic)	1 case
Vaginismus	1 case
Imperforate hymen	1 case
Records defaced	2 cases
—	74

It is well known that the first pregnancy following a period of sterility is likely to result in a miscarriage, and in this group of cases about one out of every five patients did miscarry. Two patients had an ectopic gestation.

The complications of pregnancy were as follows.

Miscarriage	15 cases
Threatened miscarriage; patient carried on	4 cases
Ectopic gestation	2 cases
Toxaemia	5 cases
Hyperemesis (admitted to hospital)	2 cases
Hypertension	2 cases
Hydramnios	1 case
Cerebral hemorrhage	1 case
Placenta praevia	1 case

The total number of live infants salvaged was 45, three infants were stillborn (two of these mothers afterwards had live infants), and in seven cases no records were available (infants may have been born alive).

A survey of the main table will show that the male was at fault in eleven cases in which the wife ultimately became pregnant. The successful treatment of those cases in which sperms were present, but were deficient in numbers and defective, was simple; it consisted of the removal of focal sepsis, or of sending the patient for a holiday in the open air away from his wife, or of the administration of thyroid extract. Only about one-fifth of all the males so affected responded to treatment.

In the few cases in which we had the opportunity of examining sperm samples from service men who had been in New Guinea and had taken regular suppressive doses of "Atebrin", we have not been able to demonstrate any defects in spermatogenesis from this cause. Furthermore, we know a large number of such men whose wives have become pregnant quickly on their return from active service. We are following this subject up as opportunities present themselves.

The two patients who suffered from anovulation and ultimately became pregnant presented interesting features.

The first patient (Case 186) had suffered from sterility for ten years, and she was cured after the subcutaneous injection of serum equine gonadotropic hormone over a period of three months. One may speculate whether this cure was due to the treatment, as we have not had similar success with over thirty other patients suffering from anovulation treated in the same way. The second patient (Case 170) was treated for six months with the same preparation given subcutaneously, with no result. At this juncture a myomectomy and an internal shortening operation were performed. For another six months no pregnancy resulted. Then she had two courses of serum gonadotropic hormone given intravenously. After this she was found to be ovulating at last, and she soon became pregnant. She had suffered from childlessness for eleven years, and now has a fine infant.

In asking ourselves the question whether all the effort involved was worth the results achieved we must not only base our opinion on the output of babies per 100 sterile couples; we must allow for the satisfaction of the childless partners when they really know what is wrong with them, and what their chances of a successful issue are. Many of those suffering from hopeless disorders will adopt babies, and this type of person usually lives in a home that will give the State better citizens than an orphanage.

Summary.

1. The results of investigation and treatment in 407 unselected and consecutive cases of sterility are presented.
2. Over half of these patients (221) were considered to have a reasonable chance of becoming pregnant. The remainder suffered from irremediable lesions.
3. About one in every three (74) of these patients became pregnant. Probably there were more who did not reply to letters or appear in hospital records, so that these figures represent a minimal result to be expected in public hospital practice. In private practice the figures are higher.
4. About one pregnancy in every five resulted in a miscarriage. Many of these patients are known to have had full-time infants later.
5. Two patients had an ectopic gestation.

Acknowledgements.

My thanks are due to Major R. Mackey, who worked with me in seeing a number of these patients at the public clinic before he entered the army, and to Sister Giles for her enthusiasm. Mr. Frost, our laboratory and X-ray technician, gave his ungrudging cooperation. I thank the members of the staff of the hospital for referring patients to the clinic. Finally, I am indebted to the Director-General of Medical Services for his permission to publish this paper.

References.

- (1) A. E. Mander: "Alarming Australia", page 23.
- (2) M. Barton, F. J. Browne, V. B. Green-Armytage and others: *British Medical Journal*, October 16, 1943, page 492.
- (3) A. M. B. Grant: "Infertile Marriage or Sterility", *THE MEDICAL JOURNAL OF AUSTRALIA*, Volume I, May 31, 1941, page 672.
- (4) J. Rock, M. Bartlett and D. D. Matson: "The Incidence of Anovulatory Menstruation among Patients of Low Fertility", *American Journal of Obstetrics and Gynecology*, Volume XXXVII, January, 1939, page 3.
- (5) M. Moore-White: "The Effect of Follicular Hormone on Non-Patent Fallopian Tubes", *British Medical Journal*, March 2, 1940, page 342.

GENERAL ASPECTS OF STERILITY IN THE FEMALE.¹

By J. W. JOHNSTONE,
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THIS discussion is given to you at the invitation of the committee of inquiry into the medical aspects concerned in the decline in the birth rate. This committee was

¹ Part of a symposium on sterility, held on October 25, 1944, at a meeting of the Victorian Branch of the British Medical Association at the Women's Hospital, Melbourne.

instituted by the Federal Government at Canberra, and the president of this meeting tonight is also the chairman of that committee. As Professor Marshall Allan has said, the subject of sterility is one which commends itself to our attention particularly at this time because of the interest which is now being taken in the decline in the population. This problem is one which is causing concern to all the white races, but there are reasons which make it of peculiar interest to us here in Australia.

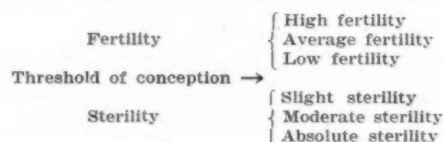
The main political interest centres round the over-all reproductive rate of the race—that is, the natural fecundity of the species. This wider subject involves not only the question of barren marriages, but also that of persons who do not marry, and of those who elect to limit their family to a few. There can be little doubt that the greatest single factor in the decline in the general birth rate is the voluntary limitation of reproduction by the masses, in order to meet social and economic circumstances. Our discussion tonight, however, concerns exactly the reverse—the lesser medical problem of the involuntary sterility of the individual.

Definition.

Sterility may be defined as the failure to conceive or to initiate the reproductive process. If the process is initiated, but abortion in sequence occurs, then the woman is infertile, but not considered clinically sterile. After one year has elapsed, some anxiety may be felt about a woman's fertility; but a good working rule is to allow two years as a reasonable time for conception to occur; that is to say, unless a woman elects by contraceptive means to prevent pregnancy, from the practical and clinical point of view she may be considered sterile after two years of marriage.

Degrees of Sterility.

It is obvious that sterility is only a relative term; that there are all degrees of fertility, from a high degree of fertility down to absolute sterility. We may represent the various degrees of reproductive capacity graphically on a sliding scale. Commencing above with those who are endowed with physiological perfection, we pass through those with the various lesser degrees of fertility, past the threshold of conception and those who have "just a touch of sterility", down to those who are absolutely sterile.



Thus we see that there are two classes of sterility—firstly, sterility of absolute degree, and secondly, sterility of relative degree. This conception of the relative degrees of sterility is fundamental for a proper perspective of the subject.

Let us look at it in another and more practical way. If we take an animal, say a bull, and turn him out with a cow—young, and healthy and willing—then something is sure to happen. Conception is not only almost invariable, but usually immediate. By these standards of physiological perfection, and in fact by comparison with many other species, the human breeding rate is on the low side.

When 100 healthy persons marry and take no precautions, only a small minority of the wives will become pregnant immediately. The majority will become pregnant after delays up to one year. Sporadic pregnancy will take place with diminishing frequency over successive years, and approximately one in ten will remain permanently childless.

Incidence of Sterility.

It has been estimated⁽²⁾ that approximately 10% of marriages amongst the working class are involuntarily sterile, while in the so-called leisured classes the figure approximates to 15%. As the industrial classes are much

in the ascendancy, it follows that the over-all incidence is something over 10%. These figures are quoted from English and American sources, and I know of no reason why our own should differ greatly. This high incidence gives us some idea of the magnitude of the problem which should interest the medical profession. The misery which it brings into the lives of many is evident, and the spectacle of the barren woman gathering fresh determination and increasing anguish as she passes from one investigator to another, is familiar to us all. It has been said with some truth that there are only two classes of gynaecological patients—those who are ill because they are having children they do not want, and the remainder, who are ill because they are not having the children they do want. It is a fact that human nature is such that permanent childlessness is rarely deliberate.

The curse and stigma of sterility have been a cause of extreme sorrow since the earliest recordings. We read in Genesis that "when Rachel saw that she bare Jacob no children, Rachel envied her sister; and said unto Jacob, Give me children, or else I die". That was some thousands of years before Christ. Even now the subject has penetrated into the ambit of the political minds and assumed national importance. Commonwealth help is being made available to stimulate interest in the subject, and to assist in the establishment of clinics in this and other hospitals throughout the capital cities for the better investigation and treatment of patients.

Ætiology.

Successful gestation results from a complex series of events involving anatomical and physiological factors. Diagrammatically the prerequisites of conception may be represented as in Figure I: (i) the delivery of adequate

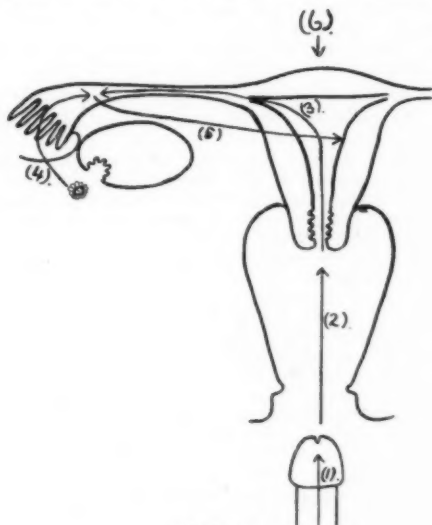


FIGURE I.

spermatozoa by the male; (ii) their reception into the lower genital passages; (iii) their ascent through the higher genital passages; (iv) the production of adequate ova by the female; (v) successful transport and embedding of the zygote (for the sake of clarity its pathway is shown divaricated out into the broad ligament; I mention this point because of the student who stated that it was not until he had seen this diagram that he realized what the parovarian duct was for); (vi) general, constitutional, extragenital factors influencing fertility in the female.

Let us elaborate on these ætiological factors and consider them in their anatomical sequence.

1. *The Male Partner.*—That the male plays an important part is now becoming increasingly recognized, and that subject is discussed by others more qualified to speak.

2. *The Vulva.*—Conception has occurred through a pin-hole hymen, but it is unlikely without penetration. *Effluvium seminis* is often a normal physiological event after intercourse, and probably plays little part in sterility. It is surprising how frequently patients, by a process of false rationalization, account for their disability because of this happening. They believe, of course that the baby is made and deposited *in toto*. The disabilities at the vulva fall into two classes, either singly or in combination: (a) mechanical barrier (so-called rigid hymen), (b) functional barrier (vaginismus, or an apprehensive hyperæsthesia whereby a spasm is produced at the thought of unwelcome sexual congress).

3. *The Vagina.*—The normal acidity of the vagina exhausts the motility of sperms within a measurable time, unless they find the haven of the cervical mucus plug, which exerts a chemotactic affinity on sperms activated by acidity. The environment of the cervix is made more favourable by the alkaline seminal fluid and the outpouring of cervical mucus during sexual excitement. For this reason the failure of the orgasm may play a minor part in sterility, but certainly not as much as many patients believe. Orgasm incapacity is a common disability in the varying scale of sexual libido experienced by the female.

4. *The Cervix.*—A number of factors connected with the cervix are important. (a) The first is position and direction. If the cervix is directly inseminated, or left bathed in a seminal pool, ascent of spermatozoa into the higher passages is more likely. (b) The second is occlusion. The so-called pin-hole os has probably no significance, apart from suggesting an infantile state of the genitalia. (c) The third is the presence of diseases, lacerations, erosions and infections; these probably play little part. (d) The fourth is physiological hostility of the cervical secretions to sperms, or to particular sperms; this is under investigation.⁽²⁾ The degree of receptiveness is known to vary with the phases of the menstrual cycle, the cervix being most receptive and easily penetrated at the time of oestrous and ovulation.

5. *The Uterus.*—The following are factors connected with the uterus. (a) Hypoplasia is common, usually in the form of the so-called cochleate uterus having a small body acutely anteflexed on a relatively long, tapering cervix, often with a pin-hole os and a narrowed vaginal vault. Scanty menstrual periods and spasmodic dysmenorrhœa often accompany the sterility. The local changes are but a reflection of insufficient hormone stimulus from a more deep-seated endocrine dyscrasia. (b) Displacement, especially retroversion, may congest the endometrium or Fallopian tubes, or produce actual kinking. (c) Endometritis is becoming less frequent with the recognition of *metropathia hæmorrhagica* as a separate entity. (d) Fibroid tumours are both a cause and result of infertility. (e) Adenomyoma, polypi and endometriosis may be present.

6. *The Fallopian Tubes.*—The Fallopian tubes may be affected by (a) lesser degrees of blockage and physiological disturbance, mucous plugs, kinking, fine adhesions, or (b) gross occlusion and disease, usually pyogenic, gonococcal, or occasionally tuberculous.

7. *The Ovaries.*—Factors affecting the ovaries are as follows. (a) With regard to anovulation, it is becoming increasingly recognized that sporadic anovular cycles are common in many women, and in a few the condition is habitual. It is common during the establishment of the menses at puberty, and after the late thirties. The same condition, when elevated to a pathological degree, produces the state of functional menorrhagia, the hæmorrhage in both cases occurring from an endometrium still in the proliferative phase. (b) Inflammation, usually periophoritis from surrounding structures, with blockage of the tubo-ovarian hiatus, may be present. (c) The tumours and cysts may be causing sterility. (d) The ovaries may have been removed or irradiated.

8. *Constitutional Factors.*—Constitutional factors are as follows. (a) The first is age. Fertility rises sharply to a maximum at about the age of twenty years, declines slowly to the middle thirties, and drops rapidly thereafter. Bio-

logically, the female is intended to have her family in the late teens and early twenties, before the peak of fertility is past. (b) Debility and intoxications may be present. While some diseases, such as diabetes, greatly depress fertility in both sexes, it is surprising what little influence gross constitutional depression may have, and conversely, how healthy the sterile often appear. (c) Endocrine deficiency and thyroid, pituitary and ovarian dyscrasias are common. (d) An unexplained residue remains. In many cases no cause can be found for the sterility, which may well be due to blood factors, vitamin deficiency, or depressive nervous states.

Comment.—From the foregoing discussion it is obvious that in a barren mating more than one sterility factor may be present, and the various factors may operate with different degrees of intensity. An adverse combination of factors may depress fertility into a state of clinical sterility. In the absolutely sterile marriage one bar to conception may be found, such as complete tubal blockade or the absence of the essential sex cells in either partner. In the relatively sterile marriage, no depressing influences, or several, may be demonstrable. When we analyse the problem and break it down into its component parts, more amazement may be expressed at the frequency with which conception is achieved, rather than at its more occasional failures.

Investigation.

The knowledge of the ætiological factors provides a firm basis for the systematic investigation of the barren mating, which should be the unit of investigation, rather than either individual partner.

Examination of the Male.

The reluctance with which the male presents himself is well known, and is not without sound basis, as the diagnosis of impaired fertility induces severe psychological trauma.

Examination of the Female.

The History.—The history should take into account such factors as age, sterile period (with due regard for the use of contraceptives), sex life and intercourse, abortions, pelvic infections, gonorrhœa, and menstrual data.

The General Medical Examination.—A search should be made for general constitutional states and endocrine disorders.

Routine Gynecological Examination.—All local gynecological lesions from the vulva to the ovaries should be borne in mind.

Rubin's Insufflation Test.—A positive result to Rubin's test is the simplest means of establishing the patency of the Fallopian tubes. Reliance is placed on the fall of pressure on the manometer and the characteristic bubbling on suprapubic auscultation, and the occurrence of shoulder pain is certain confirmation. A negative result is not conclusive and demands repetition, perhaps with atropine, or an X-ray examination. It is my belief that a negative result when obtained is often due to too abrupt raising of the gas pressure, with consequent induction of isthmospasm. Instruments incorporating a kymographic tracing of the gas pressure are now in common use, and it is hoped to import some of these. With this instrument normal tubal peristalsis is differentiated from the irregular and atypical contractions which characterize partly blocked and diseased Fallopian tubes.

Hysterosalpingography.—After injection of radiopaque material, hysterosalpingography confirms the blockage, and gives added knowledge of tubal abnormality. Its constitution for the gas test as a routine measure is not without disadvantages, and it has yet to be shown conclusively that it has advantages either from its mechanical turgor or from inherent therapeutic properties.

Endometrial Biopsy.—The presence of proliferative endometrium in the immediate premenstrual period is reliable evidence of absence of corpus luteum, and presumptive evidence of anovulation in the cycle. The specimen can

be taken with an ultra-fine curette or with special instruments designed for the purpose and provided with a trap for the fragment.

Comment.—It follows that investigation of a sterile mating is a painstaking procedure, requiring some special equipment, justifying special organized attack, and necessitating in some cases the cooperation of radiologist, pathologist, urologist and others.

Treatment.

Intelligent treatment presupposes complete preliminary investigation. In some cases treatment is directed mainly to one gross factor; in others it may be aimed like grape-shot at a number of areas with the idea of elevating the general fertility.

1. General advice should be given regarding the hygiene of conception and sex life, with due regard for timing and spacing of intercourse, and the value of holidays.

2. Dietetic treatment may be instituted, a diet rich in protein and vitamin E being given.

3. Douches may be recommended. The indiscriminate use of chemicals and alkalis is likely to be harmful. More rational would be the use of Ringer-glucose solution as a precoital douche, advised by MacLeod and Hotchkiss,⁽⁹⁾ as this medium enhances the endurance of spermatozoa experimentally, and its use is based on sound physiological principles.

4. Endocrine preparations may be given. Thyroid extract as a non-specific remedy is useful, and can with advantage be given to both husband and wife, even in the absence of demonstrable thyroid deficiency or depression of the metabolic rate. Ovarian hormone has been used to provide a nutritive stimulus to under-developed genitalia, either in small continuous dosage, or in larger block doses superimposed on the phases of the cycle. Pituitary and chorionic gonadotrophic hormones have a theoretical use in some cases.

5. Insufflation of gas and also fluid injection may be tried.

6. Gynecological abnormalities may be corrected surgically.

7. Plastic reconstruction of the Fallopian tubes may be tried. This provides a field for ingenuity, but the results so far are poor. Measures which suggest themselves for improvement are the use of more delicate instruments, greater operative facility acquired with practice, the use of amniotic coverings, and early and repeated post-operative insufflation.

8. Ovarian transplantation of Tuffier⁽¹⁰⁾ may be used as a last resort in completely disorganized tubes. Some years ago I remember hearing of a pregnancy following this operation performed by one of our staff, and at that time perhaps I felt that it formed a good follow-up embellishment. I have since learnt the details of the patient and of her subsequent pregnancy. In passing, then, I may pay a tribute to the resourcefulness in those early days of the senior member of our staff, Colonel Edward White, now for long a prisoner of war in the north.

9. Ovarian stimulation by fractional irradiation has been advised by many.⁽¹¹⁾

10. Artificial insemination with the husband's semen would seem to have no obvious advantage over the natural method of deposition, unless there existed some fault in the delivery-reception mechanism. The donor's semen is presumably becoming more widely used in selected cases in other parts of the world.

Analysis of Cases.

An analysis of 200 cases of sterility was made, 48 from private practice and 152 from hospital out-patient records. I am well aware of the small number of cases, and because of the incompleteness of the investigation, the results can be accepted only with a broad interpretation. The factors are set out in Table I, and it is to be noted that the percentage incidence does not necessarily total 100, as no factor, or more than one factor, may be operative in each case.

TABLE I.
Female Sterility: 200 Cases.

Causes.	Factors in 200 Cases.	Percentage Incidence.
Constitutional Factors.		
Late marriage (age over 30 years)	15	7.5
Endocrine deficiency...	16	8.0
Debility; chronic disease ..	2	1.0
Local factors.		
1. Vulva and vagina ..	3	1.5
2. Cervix and uterus:		
(a) Hypoplasia ..	43	21.5
(b) Displacement ..	42	21.0
(c) Fibroid tumours ..	6	3.0
(d) Polypi ..	3	1.5
(e) Congenital abnormality ..	1	0.5
3. Fallopian tubes:		
(a) Completely blocked ..	74	37.0
(b) Physiologically blocked ..	?	?
4. Ovaries:		
(a) Cysts and tumours ..	6	3.0
(b) Anovulation ..	?	?

Discussion.

Amongst the general factors, late marriage and delay in conception due to the use of contraceptives are factors of some importance. Endocrine deficiency, usually of the pituitary type and often associated with genital hypoplasia, is common. The part played by diet and vitamins is not determined; but constitutional debility and chronic disease, as judged by the ordinary methods of clinical examination, are remarkable by their absence; there were in this series only one case each of heart disorder and asthma, both conditions being doubtful in their effect.

Amongst the local factors attention is at once directed to the Fallopian tubes as occupying a special place. Tubes may be classified somewhat as follows: (i) completely blocked, (ii) physiologically blocked, but open with injection; (iii) abnormal, with permeable lumen; (iv) physiologically perfect.

In this series 37% of Fallopian tubes would appear to be completely blocked, from the following causes: aetiology unknown, 21.5%; post-abortion and puerperal sepsis, 12%; gonococcal origin, 3.5%. Not in every case was the blockage confirmed by repeated tests or by X-ray examination; but if allowance is made for this error, the figure agrees well with Rubin's⁽⁶⁾ own figure of 32% in his 5,264 cases. Sharmon⁽⁷⁾ and many others arrive at a figure of something over 30%. These completely blocked tubes, unless they can be moved up into one of the other classes, will cause absolute sterility.

Our greatest interest centres on the second type of tubal blockage. It is generally believed that these tubes, anatomically normal but physiologically blocked, stuck or kinked, and able to be opened with insufflation, are a factor of major importance, and the one which meets with most success in treatment. That is to say, Rubin's test is not only a necessary adjunct in establishing the diagnosis of absolute sterility, but it is the greatest single weapon in our therapeutic armamentarium.

Abnormal tubes with patent lumen will cause relative sterility, as the mere passage of gas or radio-opaque substance demonstrates only the anatomical permeability of the lumen and throws little light on the physiology, muscular peristalsis and ciliary currents of the tubes or the tubo-ovarian gap. It is held that the kymographic tracing of the response to Rubin's test throws some light on these aspects.

Thus we see that something over 30% of female subjects have blockage of the genital passages, with no chance of union of the essential male and female gametes. If we add to these those few cases (perhaps 1% to 5%) in which the female element is absent through habitual anovulation, and those cases (perhaps 10%) in which the male elements are grossly deficient, we see that something less than 50% of cases are in the class of absolute sterility. The prospects of successful therapy in this group are rather dismal.

In the remaining slightly more than 50% of cases relative degrees of sterility exist from factors in various combinations. Roughly, in order of importance, these are:

Fallopian tubes physiologically impaired, genital hypoplasia, uterine retroversion, tumours of the genitalia, difficulty in intercourse, impaired male fertility, constitutional states. In this group there are hopeful prospects of successful gestation.

Results of Therapy.

In the small series of 48 private cases a follow-up was made, and in spite of the fact that several have been investigated only very recently, twelve of the women are known to have become pregnant, one twice. The actual figures are as follows: 20 of the 48 patients had blocked Fallopian tubes, one became pregnant; 28 of the patients had patent tubes, eleven became pregnant; seven patients are now pregnant, four babies have been born and two abortions have occurred. Details are set out in Table II.

TABLE II.

Case Number.	Duration of Sterility. (Years.)	Remarks.	Results.
I	3	March, 1943: Rubin's test; tubes blocked.	May, 1944: pregnancy.
II	1½	October, 1941: gland dyscrasia. Thyroid extract, vitamin E, Rubin's test advised.	December, 1941: pregnancy. July, 1944: pregnancy.
III	2	March, 1944: Rubin's test, ventrosuspension.	August, 1944: pregnancy.
IV	3½	April, 1943: Rubin's test, ventrosuspension.	July, 1943: pregnancy.
V	4	July, 1943: Rubin's test, excision of resilient hymen.	March, 1944: pregnancy.
VI	2	July, 1943: Rubin's test, hormones (genital hypoplasia).	January, 1944: pregnancy.
VII	3	December, 1943: Rubin's test.	January, 1944: pregnancy.
VIII	3	November, 1943: Rubin's test. May, 1944: husband returned from army.	August, 1944: pregnancy.
IX	3	March, 1944: Rubin's test.	April, 1944: pregnancy (abortion).
X	?	December, 1943: Rubin's test.	January, 1944: pregnancy (abortion).
XI	4	March, 1943: Rubin's test (slow leak only). February, 1944: Rubin's test (high pressure only).	June, 1944: pregnancy.
XII	4	May, 1942: Operation requested: "tubes blocked to gas". June, 1942: hysterosalpingography; tubes normal.	September, 1942: pregnancy.

Discussion of Cases.

In Case I the fallacy of regarding the Fallopian tubes as blocked after one insufflation is evident. That the tubes may have been abnormal with a slow leak is suggested by the long latent interval. The test was made under general anaesthesia, which I now regard as a disadvantage, as the stertorous breathing upsets auscultation of gas, and confirmation by the occurrence of omalgia on the patient's sitting up is impossible.

In Case II, pregnancy occurred without Rubin's test, and the part played by therapy in either of the pregnancies is doubtful.

In Cases III and IV correction of retroversion as well as insufflation was performed; both patients became pregnant almost as soon as intercourse was resumed.

In Case VIII the test was performed while the patient's husband was in the army, and she became pregnant soon after his discharge. The effect of army routine on the husband is to be considered.

The patient in Case X was a nurse, married to an allied serviceman and fellow-countryman, and both were well informed on the medico-scientific aspects of sterility. She was in her late thirties, and there was a combination of reasons which made pregnancy not only desirable, but a matter of urgency. By special request, I performed the test

nine days after her menstrual period ended. At the time of the test, the husband produced a long graph of the calendar dates, going back many months indeed. On this were recorded, in red, the times of her menstrual periods, interspersed with which were arrows indicating the times at which she believed she felt the *Mittelschmerz* of ovulation. Underneath was a daily graphic recording of her basal temperature, taken at 6 a.m. each day *per rectum* (the half degree depression of this is said to indicate ovulation). There could be little doubt that she was in imminent expectation of an impending ovulation. The husband remained present during the test and expressed evident delight at the passage of gas and the shoulder pain. After thanking me with characteristic courtesy, he forthwith led her away, rejoicing.

She did not see her next menstrual period, but I was sorry indeed to hear that she subsequently aborted on the journey back home to her native land.

In Case XI Rubin's test revealed a slow leak only at high pressure, and the result might even have been doubtful except for the omalgia. Follow-up investigation revealed that the patient was later retested by Dr. Simpson in the out-patient department, and the gas again did not pass until a pressure of over 180 millimetres of mercury had been reached. To quote from her letter of October 4: "First of all would like to thank you for your kind interest on my behalf. Re my failing to return after the six months had elapsed, to be quite truthful was a matter of finance. Early this year was recommended to visit the Women's Hospital . . . was treated by Dr. Simpson. I am pleased to inform you, Doctor, after another "tube test" and a course of tablets, have not had a period since June 24. Exceedingly happy about same. Thanking you once again. . ."

The patient in Case XII came requesting that she be operated upon, because she had been told that her Fallopian tubes were "blocked to gas". Dr. Colin Macdonald performed hysterosalpingography for me and reported that the tubes were normal, with free escape of lipiodol into the peritoneal cavity. This served as a good illustration of the fact that oil will often pass where gas will not. To quote from her letter: ". . . I am happy to tell you I now have a beautiful baby girl, 16 months old, so the pills you gave me were quite successful. I only required to take one lot. I never had any miscarriage, the only thing was my periods continued for 3 or 4 months. I always intended calling on you to let you know, but I never got there. Then when I was in 'Mena House' I saw you one day when you were attending someone there, and I was going to ask sister if I could see you, but I didn't like to. Thanking you for your kindly interest. . ."

I make no claim for the few oestrogenic pills, but give the credit to Dr. Macdonald.

Conclusion.

In this small series of 48 cases I believe that most of the pregnancies were the direct result of therapy, and without it perhaps six or seven homes would have been barren and the nation likewise the poorer. There is much to be said for the statement that our greatest national asset is not the yearly wool clip, nor yet the wheat harvest, but the yearly amount of new life enlisted into the productive service of the community.

My purpose in quoting the contents of some of the rather personal communications, is not merely to illustrate the value of follow-up investigation, nor the cause-effect relationship existing between insufflation and pregnancy, nor yet the mathematical results of therapy, but rather to show the profound happiness which it may bring into the lives of many of these barren homes—something which is not measured in any cold, political, mathematical, statistical analysis of the yearly increment in the birth rate.

I am reminded again of those words of Rachel, when she said to Jacob: "Give me children, or else I die."

References.

- ⁽¹⁾ S. R. Meaker: "Human Sterility", 1934, page 7.
- ⁽²⁾ A. W. Bourne and L. H. Williams: "Recent Advances in Obstetrics and Gynecology", Fourth Edition, 1939, page 184.
- ⁽³⁾ J. MacLeod and R. S. Hotchkiss: "Use of Precolital Douche in Cases of Infertility of Long Duration", *The American Journal of Obstetrics and Gynecology*, Volume XLVI, September, 1943, page 424.

⁽⁴⁾ T. Tuffler: "Transplantation of the Ovary with its Vascular Pedicle into the Uterus after Salpingectomy", *Surgery, Gynecology and Obstetrics*, Volume XXXIX, October, 1924, page 401.

⁽⁵⁾ M. Friedman and R. S. Finkler: "Treatment of Sterility with 'Small Dose' X-Ray Therapy", *The American Journal of Obstetrics and Gynecology*, Volume XLIII, May, 1942, page 852.

⁽⁶⁾ I. C. Rubin: "Uterotubal Insufflation as Test for Tubal Patency", *The American Journal of Obstetrics and Gynecology*, Volume XL, October, 1940, page 628.

⁽⁷⁾ A. Sharman: "Some Recent Studies and Investigations in Sterility", *The Journal of Obstetrics and Gynecology of the British Empire*, Volume LI, April, 1944, page 85.

HYSTEOSALPINGOGRAPHY IN STERILITY.¹

By COLIN MACDONALD,
Melbourne.

It is twenty years since the non-irritating and radio-opaque chemical combination of iodine and poppy seed oil known as lipiodol was employed by Carlos Heuser and Umberto Carelli, of Buenos Aires, to visualize the cavities of the cervical canal, the uterus and the Fallopian tubes; the procedure has proved simple and safe, satisfying the canons of sound radiological practice. In sterility, its value is twofold; it is of value diagnostically, and it is valuable therapeutically. Indeed, some hold that it is the most successful single agent in the treatment of sterility.

Hysterosalpingography is a more expensive procedure than Rubin's insufflation test, but it yields more reliable and more detailed diagnostic information, as well as considerably better therapeutic results. In addition to providing visual evidence of tubal obstruction, it shows its site and sometimes its nature, as well as revealing developmental abnormalities of the uterus. My experience is that too often Rubin's test suggests tubal obstruction, while lipiodol injection shows unequivocally that both tubes are patent.

I believe that misleading results obtained with air insufflation are frequently due to the performance of Rubin's test without adequate antispasmodic preparation.

In the therapeutics of that type of sterility which is due to tubal obstruction, the passing of lipiodol through the tube appears to be much more efficacious than that of air. Its beneficial results are ascribed to (i) the clearing from the cervical canal and Fallopian tubes of mucus and secretions, (ii) the relief of spasm (by the oil distension), either at the internal os, or in the uterus or tubes, (iii) the breaking down of adhesions, on either the mucosal or the serous sides of the tubes, and (iv) the straightening out of tubal convolutions and kinks. After plastic operations on the Fallopian tubes, lipiodol injection may serve a purpose by preventing the development of adhesions.

Contraindications.

The contraindications to hysterosalpingography are well known; they are (i) acute or subacute infections in the vulva, the vagina, the cervix, the Fallopian tubes or the pelvis, (ii) uterine hæmorrhage, (iii) suspected pregnancy, (iv) fever from any cause, and (v) severe pulmonary or cardio-vascular disease.

Because of the possibility of intravasating the oil into the blood stream and so producing oil embolus, it is unwise to inject oil during the week before menstruation; many prefer to make the injection some time between the eighth and the twelfth day after a menstrual period, though others hold that better therapeutic results are obtained if the injection is made the day after cessation of menstruation.

Method.

The instrument I use is one introduced to me some twelve to fifteen years ago by Dr. Milne Sutherland (my mentor in this procedure), and is originally due to Claude Bécélère, the French radiologist. It is designed primarily

¹ Part of a symposium on sterility, held on October 25, 1944, at a meeting of the Victorian Branch of the British Medical Association at the Women's Hospital, Melbourne.

ILLUSTRATIONS TO THE ARTICLE BY DR. F. A. BELLINGHAM.



FIGURE I.—Endometrial biopsy (taken three days prior to a menstrual period) showing secretory endometrium.

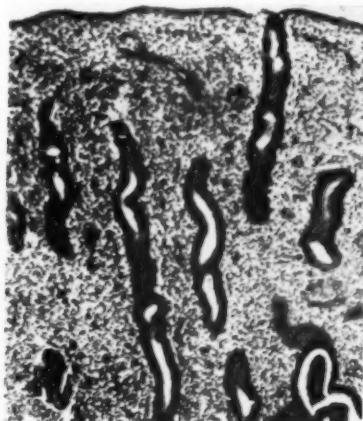


FIGURE II.—Endometrial biopsy (taken three days prior to a menstrual period) showing non-secretory (anovular) endometrium.



FIGURE III.—Normal tubes. Bilateral patency.



FIGURE IV.—Same case as that shown in Figure I, showing forty-eight hour "spill".



FIGURE V.—Bilateral cornual occlusion.

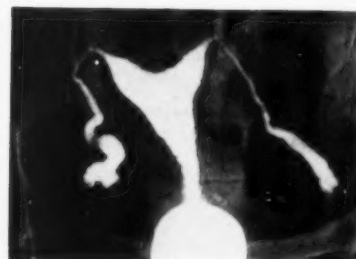


FIGURE VI.—Occlusion of both tubes at the fimbriated ends; forty-eight hour film, showing oil residues without intraperitoneal "spill".



FIGURE VII.—Congenital bicornuate uterus. Patent tubes.



FIGURE VIII.—Uterus and tubes injected, but also subendometrial infiltration of oil into the uterine plexus of veins.



FIGURE IX.—Subendometrial injection into the uterine plexus of veins.

ILLUSTRATIONS TO THE ARTICLE BY DR. BRUCE SHALLARD AND DR. OLIVER LATHAM.

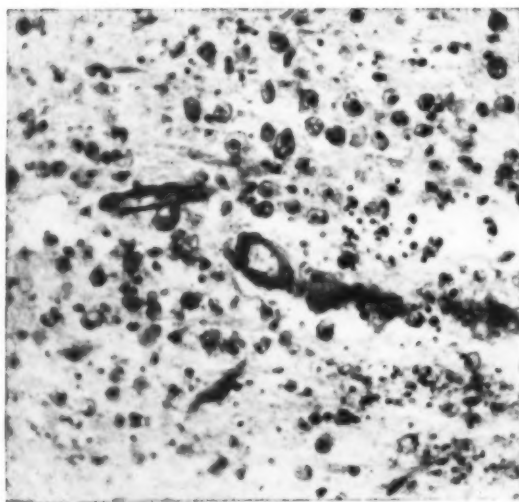


FIGURE III.

Section from an area of disintegration and demyelination. The damaged vessels have thick walls and many *Gitterzellen* and adventitial cells, and a few red cells surround the vessel and pervade the surrounding tissue. ($\times 100$; iron hæmatoxylin and Van Gieson stain.)

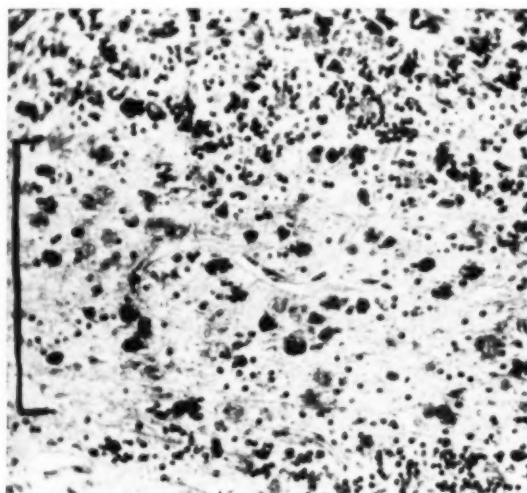


FIGURE IV.

Myelin core of a cerebellar folium. Between two portions of the granular layer runs the myelinated core (marked off), which, however, reveals an abnormal number of dark and light staining cells, *Gitterzellen*, endothelial and glial cells and fibres. ($\times 100$; Mallory's triple stain.)

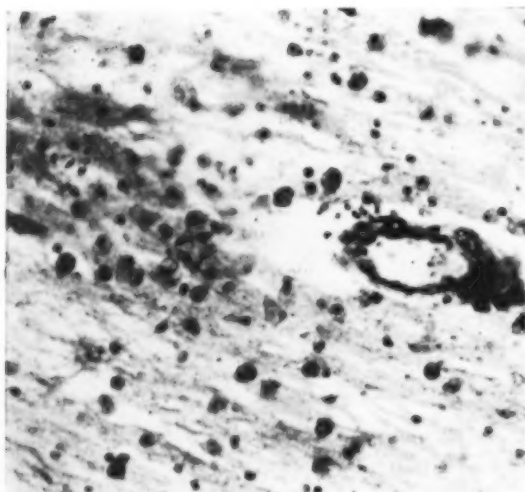


FIGURE V.

More magnified view of vessels in *centrum ovale*. Note cellular infiltration of walls and collections of cells both near to and apart from the vessels, and the evident oedema and separated myelin fibres. ($\times 100$; iron hæmatoxylin and Van Gieson stain.)

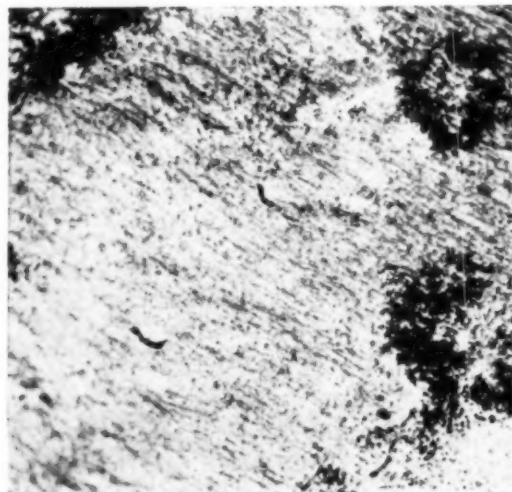


FIGURE VI.

Note the ring hemorrhages and the myelin fibres, black where healthy, and the paler areas denoting degeneration. Sometimes the demyelination is abrupt, as in disseminated sclerosis ($\times 100$; Weigert's myelin stain.)

to prevent the escape back into the vagina of the lipiodol injected into the uterus. Both gravity and inherent uterine contraction tend to bring about this leakage and expulsion, even when the Fallopian tubes are patent. Two vulsella are attached by a sturdy clip and bayonet arrangement to the cannula (which holds at its tip a rubber acorn), and when its nozzle tip is screwed upwards into the cervical canal, these vulsella pull the cervix tightly down over the rubber acorn and prevent any leakage back into the vagina. A stop cock, near the syringe end of the cannula, prevents any back flow into the syringe, and the instrument has the advantage of being self-retaining. When the oil has been injected into the uterus, one can comfortably leave this instrument *in situ* to watch developing films, or wait until uterine or tubal spasm relaxes, knowing that the expensive lipiodol will not empty into the vagina to nullify the whole procedure. To satisfy completely the radiological principles of injecting contrast material into a hollow muscular cavity, there should be no vaginal reflux; such a reflux, confusing to diagnosis of an obstruction, is akin to the free escape of emulsion *per anum* when a barium enema is administered for the diagnosis of colonic disease. I know that in the case of *nulliparae* with a firm and healthy cervical canal it is often possible to inject lipiodol into the Fallopian tubes and avoid any vaginal leakage without the use of Bécclère's instrument, but in the case of *multiparae*, or when the cervix is torn or is soft and unhealthy, I have found it not always possible to produce a complete obturation of the cervical os without the use of this instrument. It possesses a manometric attachment near the base of the cannula, and Bécclère stressed the necessity for manometric control. But I never employ it; I do not think it serves any more useful purpose in the case of an unanaesthetized patient—particularly when the procedure is under fluoroscopic control—than it would in retrograde pyelography. In the uterus, as in the renal pelvis, I believe that the patient's sensation of pain is probably a better indicator of undue intracavity pressure than the manometer. (Incidentally, those who use manometric control—and they are apparently few—hold that the injection pressure should not exceed 300 to 350 millimetres of mercury.) The injection is made in easy stages, and when possible under fluoroscopic control. Initially, oil is injected until the patient complains of suprapubic discomfort; the injection is then temporarily stopped, and the stop cock is turned so that there can be no reflux. Usually, at this time, it is found that the uterus is filled, but that none of the oil has passed into the Fallopian tubes. At this stage a film is exposed with the under-table tube. After a minute or two the discomfort often passes off, when the uterine tone has accommodated itself to the oil distension. The injection is now resumed and continued until a further complaint of discomfort is made; usually by this time the tubes are outlined to their fimbriated ends, providing they are patent. Another film is made. I wait again for a minute or two, until this attack of discomfort passes off, and then the third and last injection of oil is given. I have found that this slow and interrupted method of injection is the most satisfactory method of introducing the oil. The last film is exposed with the overtable tube through the Potter-Bucky diaphragm. A film is, of course, always exposed twenty-four hours after injection, and in some cases, additional films are exposed at further intervals. I consider that the injection by easy stages is of first importance; it is in accordance with the physiological law that the intensity of myotatic response—the essential cause of spasm, of which I shall speak later—is proportional to the rapidity of application of the stress.

The radiologist knows very well how in any hollow muscular viscus spasm can simulate organic obstruction; the uterus and its tubes are no exception, and so the causes of spasm must be reduced to a minimum. Some spasm seems to be inherent in hollow muscular viscera; but much, I believe, is due to the apprehension and discomfort caused by the hysterosalpingographic procedure. I therefore give adequate preliminary doses of barbiturate (usually three grains of "Seconal" in divided doses), and

to the highly strung type of patient I give also one-sixth of a grain of morphine hypodermically. I aim to have the patients drowsy during the procedure, but quite able to tell me when the intrauterine pressure of lipiodol is causing discomfort or pain. This sedation may seem excessive to some; but the procedure, though simple enough, does upset some women, thereby inducing spasm, and spasm is the radiological trap to be avoided if at all possible. I have little faith in the time-hallowed antispasmodic, atropine; in my experience the barbiturates are much more effective on smooth muscle. Such sedation means that hysterosalpingography is usually not an "office" procedure (to use an American idiom). In our private clinic, after undergoing the procedure in the morning, the patient is put to bed until the late afternoon.

Discussion.

There is little doubt that hysterosalpingography is of value in the treatment of certain types of sterility. The latest comprehensive statistics to be published are those of Green-Armytage, of the Post-Graduate Hospital at Hammersmith, who during the past seventeen years has investigated 2,000 cases of sterility by lipiodol injection. His figures are presented in a paper in *The Journal of Obstetrics and Gynaecology of the British Empire* of February, 1943. He found that among those women in whom one or more Fallopian tubes were patent, 30% of the public hospital patients and over 40% of the private patients had subsequently conceived and gone to term. American results are substantially in agreement with these English figures. Green-Armytage suggests that such therapeutic results may be due to the heavy poppy-seed oil acting bacteriostatically on the mucous membrane of the uterus and Fallopian tubes, or that possibly the lipiodol has a stimulating action on the ciliary mucous membrane and the white tunic of the ovary, or that it may break down sticky adhesions and thereby reawaken rhythmic movement of the tubes, which once again are able to transmit an ovum from the fimbria to the isthmus. In passing, it may be mentioned that it was Rubin (in association with Benedick) who showed that there are two elements in normal tubal peristalsis: (i) a worm-like motion due to the longitudinal muscle fibres, and (ii) a regular peristaltic movement from the fimbriated ends to the uterine cavity, at the rate of five to nine movements per minute. Green-Armytage contends that it is wrong to give a hopeless prognosis when both cornua are rounded. His long surgical experience with such cases has demonstrated that often occlusion of only the interstitial part of the tubes is present, and that the distal portions are normally patent. In such cases, he claims to have achieved successful results with intrauterine tubal implantation. From my own experience, I know that sometimes spasm alone, when it is intense, can produce rounded and completely obstructed cornua. If the procedure of lipiodol investigation is repeated after adequate sedation, the spasm may relax, the heart-shaped uterine outline (which is produced by the intense cornual spasm) gives way to the normal triangular outline, and lipiodol flows through the tubes into the peritoneal cavity, thus proving that no organic obstruction ever existed. Such is an instance of the diagnostic confusion which spasm may cause.

Complications.

Though, of course, it would be highly desirable if all diagnostic methods were absolutely safe, it is inevitable that some valuable procedures will entail certain risks. Hysterosalpingography does provide some risks and possible complications, but they are very uncommon, and must be weighed against the value of the information it furnishes. These dangers are: (i) chemical and toxic, (ii) mechanical, (iii) embolic and (iv) inflammatory.

The chemical and toxic dangers appear to be remote, because lipiodol is a bland, non-irritating liquid. The 40% of iodine is not free; it is in chemical combination with the poppy-seed oil. The oil is sterile and has a certain antiseptic quality. In isolated cases reaction in the tubes or peritoneum has been ascribed to lipiodol, and the con-

dition designated oil salpingitis or oil peritonitis. Iodism is more a theoretical than a practical complication, because of the slowness of absorption of the oil, either through the tubal endometrium or the peritoneal endothelium.

Amongst the mechanical dangers to be mentioned are perforation by the instruments used and tubal rupture through excessive lipiodol pressure. The normal Fallopian tube is said to be able to withstand pressure of 400 millimetres of mercury without rupture, but lesser pressures may, of course, lacerate it when it is weakened and softened by the pathological changes of hydrosalpinx, pyosalpinx, hæmatosalpinx, or tubal pregnancy. I have not encountered a case of tubal rupture; careful injection, under fluoroscopic control, I believe, guards against this accident.

Oil embolism, caused by intravasation of the lipiodol through the endometrium into the uterine and peritubal veins, is not infrequent; but apart from severe coughing and the raising of small amounts of blood-stained sputum, it is usually not of serious import, though cases have been reported in which death has followed oil intravasation (as have deaths from air embolus following Rubin's insufflation test). This oil intravasation may result when the permeability of the endometrium is increased, as in the pre-menstrual and post-menstrual period, or after operative trauma, or when it is the site of pathological change. It may also result when excessive pressure is applied during injection, and some hold that abnormal permeability of the endometrium exists as an idiosyncrasy. Commencing intravasation can be seen on the fluoroscopic screen (but only when the eyes are properly accommodated), and the injection can then straightaway be stopped. It may be mentioned that one's visual acuity with a fluoroscopic screen increases greatly after a preliminary ten minutes of complete darkness; this is another argument in favour of taking adequate time over the procedure.

Inflammatory reactions rarely occur after lipiodol, and result chiefly from the activation of an old inflammation of the adnexa. Though the procedure is, of course, contra-indicated when there is clinical evidence of infection, it is possible that even active pelvic infection may exist without obvious clinical findings of inflammation. It is unnecessary to mention that an aseptic and atraumatic technique is always aimed at during the procedure. This possible (but again infrequent) complication of infection leads some gynaecologists to insist that hysterosalpingography should be carried out only on patients who are in hospital.

The "Tubal Sphincter".

A small localized constriction of the lipiodol shadow at the utero-tubal angle was first described by Paul Schneider, of New York City, as the "tubal sphincter". The normal uterine cavity, after it has been filled with radio-opaque oil, usually appears as a triangular or approximately triangular shadow; the apex of the triangle is directed downwards. From the upper angles of this triangle arise the shadows representing the tubes; medially, they are thread-like, becoming of greater calibre as the fimbriated end is approached. In many cases, continuity of the shadow near the origin of the tube at the uterine horn is either narrowed or completely interrupted. Characteristic of the "shadow-narrowing" phenomenon is the fact that it always appears at a typical point—namely, at the transition of the uterine horn into the tubal shadow—sometimes unilaterally, sometimes bilaterally. It is further characteristic of this constriction, that lateral to it the thread-like tubal shadow does not begin immediately, but instead there is a somewhat wider portion. The usual interpretation of the phenomenon, suggested by its appearance, that it is an expression of a circular localized sphincteric contraction, has in no way been proved up to the present. Recently, Schneider, as the result of examination of uteri removed at operation from women aged thirty-five to forty-two years, suggests that the problem of this "shadow-narrowing" phenomenon appears to be solved. It is, he holds, produced by a folding of the mucous membrane of the corpus, and its situation is established at the boundary between the uterine cavity and the tube. The

problem as to where the portion of the shadow lateral to the constriction belongs is anatomically clarified by the identification of this part as a dilated portion of the *pars intramuralis* of the tube. On the basis of the anatomy and histology of the dilated portion of the tube, it is possible to delimit this section from the remaining portions, and so justify its designation as *antrum tube*. It looks, therefore, as if the application of the term "tubal sphincter" to this narrowing must be discontinued.

Conclusion.

I regard this X-ray examination of the uterus and tubes in much the same light as that of any other hollow muscular viscus; the same care in radiological technique and the same caution in diagnosis are required as in investigation of the stomach or colon, and there exists the same necessity for correlation of clinical and radiological findings, if the best results are to be obtained.

THE EXAMINATION OF SEMEN.¹

By H. F. BETTINGER,
Melbourne.

The responsibility for the barrenness of a marriage has been attributed to the male partner in from one to 99 out of 100 cases, according to various investigations. Even if one disregards the excessively high figures (they have been obtained by the reasoning that all sterility in females is due to gonorrhœa and that this is acquired first by the male), there seems to be no doubt that the husband is solely responsible for at least 10% of such barrenness, while in about 30% he shares the responsibility with his wife.

In these circumstances, it is astonishing that the relatively simple examination of the semen is, in the majority of cases, resorted to only after the wife has been subjected to the whole range of much more complicated (and, by the way, expensive) investigations and even surgical operations. It is unfortunately true that many men strongly resent the mere suggestion of such an examination—that they feel that their superiority and dignity are at stake. Foolish as it is, it is a factor to be reckoned with, at least for the time being. To overcome it two courses are open: firstly, part of the educational work which is one of the fundamental issues in an anti-sterility campaign will have to be directed to this aspect; secondly, if all gynaecologists would agree not to proceed with the investigation of the wife beyond the stage of the ordinary pelvic examination before the fertility of the husband is ascertained, much progress in the right direction would be made. Even from the psychological point of view with regard to the "superior" male, it is better to break off procedures at some intermediate stage of the investigation than to assure fertility of the woman by tests and operations and then find out that the husband is non-fertile.

The methods usually employed for the examination of semen may be "near enough" for quite a few cases, but are certainly not good enough if the work is done on a scientific basis. The estimation of the number of spermatozoa by a glance at the density of the specimen and of their quality by a brief microscopic examination of a drop of semen obtained under non-standardized conditions, is as obsolete as, for example, the Tallquist method for the investigation of the blood. As this method has been superseded by accurate red and white cell counts and evaluation of films, so should similar methods be employed in the appraisal of semen.

¹ Part of a symposium on sterility, held on October 25, 1944, at a meeting of the Victorian Branch of the British Medical Association at the Women's Hospital, Melbourne.

The Collection of the Specimen.

There are obviously three possible methods of collection of a specimen of semen: (i) by use of a condom, (ii) by withdrawal at intercourse, (iii) by masturbation. The third method, although theoretically the best, will be generally not practicable. A condom should never be employed; its use makes at least all findings of subnormal motility of the spermatozoa valueless. Even a careful observation of all the instructions about washing and drying the rubber sheath before use and the immediate transfer of the specimen from it will not prevent the killing of spermatozoa even after a short contact. Therefore, the method of choice is the collection of a specimen by withdrawal just before orgasm is reached and ejaculation into a wide-mouthed porcelain jar. This jar should have a china or "Bakelite", not metal, lid, because it has been shown that various metals are inimical to spermatozoa. Another point worth mentioning is the temperature at which the specimen should be kept before it reaches the laboratory. Text-books still recommend that body temperature (37° C.) should be maintained by warm water baths and by carrying the jar next to the skin underneath the clothes. This also is obsolete; high temperature causes the spermatozoa to use up their energy before proper examination is made or completed. Even in the most perfect specimen, all spermatozoa will have lost their motility after eight hours when kept at 37° C., while at 4° C. motility may be still present after four days. The patient has therefore to be advised to keep the specimen at ordinary room temperature and to carry it in an outside pocket or bag. Not more than two hours should elapse between intercourse and first examination of the semen, and intercourse should not have taken place for at least three days prior to the test.

Appraisal of Semen.

In Table I the values for a normal specimen are set out. The table indicates the minimum number of individual examinations that should be performed, and which results should be obtained. Other examinations (for viscosity, pH, survival period *et cetera*) can be carried out in addition, when thought necessary.

TABLE I.

Observation.	Normal Figures.
Volume	2.5 to 5.0 cubic centimetres.
Number of spermatozoa ..	60,000,000 to 300,000,000 per cubic centimetre.
Motility	10% to 15% immotile; 10% to 15% sluggish; 70% to 80% motile.
Film	Abnormal forms less than 20%.

In Figure I are shown the most commonly encountered abnormal forms. Only the one in the top left hand corner is a normal spermatozoon.

It is perfectly true that specimens of semen have proved to be fertile even if they did not come up to every one of these specifications. It would be quite unjustified to pronounce a man as non-fertile because, for example, his cell count is somewhat lower or the percentage of abnormal forms is slightly higher than set out in Table I. However, if two or more of the individual results are below normal, the man enters into the category of "lowered fertility" or "relative sterility". The outcome of a union having one such partner will, as Dr. Johnstone has pointed out earlier, largely depend on whether the other partner is perfectly fertile or also belongs to the same group. In the first case pregnancy will probably ensue without great difficulty, but in the second case it will occur probably only under optimal conditions. If these are reached after detailed instructions from the medical adviser as to general and sexual hygiene, marriages will become fertile that would otherwise remain sterile. It is in this group that the detailed appraisal of the semen is of the greatest value, for it gives information that a less detailed examination can never provide. To stress this aspect again, the summing-up of all the avail-

able evidence leads to the right decision, not a single abnormal figure. It goes without saying that all abnormal findings should be confirmed by at least one other examination before the final verdict is given.

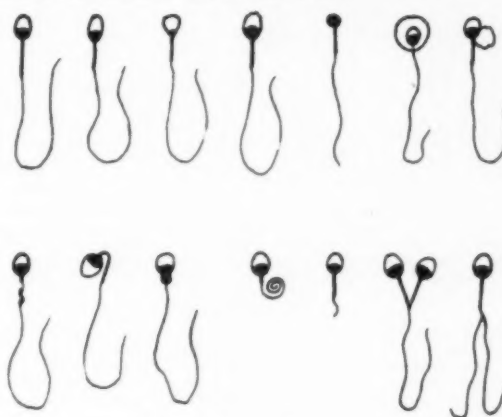


FIGURE I.

Huhner's Test.

Huhner's test is a necessary link in the chain of a proper sterility investigation, but even a positive result does not obviate the necessity for a complete semen examination. The finding of living spermatozoa in the cervical canal answers a number of important questions, but it does not give any reliable information about the quantity or quality of the spermatozoa. The tests are supplementary, but cannot be substituted for each other.

Testicular Biopsy.

Any attempt at therapy in cases of deficiency of the semen is a shot in the dark, so long as the causes underlying the deficiency remain unravelled. The only means to procure information is a testicular biopsy. This is by no means a formidable procedure. It can be done within a few minutes, the patient being ambulatory, it does not necessitate absence from work, and it causes at the most slight discomfort for a day or two. If the biopsy material is fixed in Bouin's solution (this is important), the pathologist can give a clear indication as to whether therapy would be of avail and what line it should take.

Reports of Cases.

A CASE OF ACUTE HÆMORRHAGIC LEUCOENCEPHALITIS.

By BRUCE SHALLARD AND OLIVER LATHAM,

From the Laboratory of the Mental Hospitals Department, New South Wales Government, Sydney.

A NUMBER of cases of acute unconsciousness and paralysis usually following one or other of the exanthems have excited interest, because the vast majority of patients have made excellent recoveries after most unpromising clinical states. In the few who come to autopsy, some patchy demyelinating process in the brain or spinal cord, or in both, has been found. Under the caption of diffuse sclerosis more chronic illnesses are dealt with, including such types as chronic and acute insular sclerosis at one end of the series and Schilder's disease at the other; all are much more commonly fatal. Somewhat similar pathological pictures have been obtained from horses and dogs and have been induced experimentally by the exhibition of the cyanides in poisonous doses. From 1940 onwards Weston Hurst and his associates in Adelaide have differentiated from this wide class a very fatal and acute type of lesion which in its broadest features resembles Schilder's disease. In that large areas of the *centrum ovale* are affected by a widespread demyelinating

process which entirely spares the "U" fibres and the grey matter of the cerebral cortex as a rule, though it is more general in its effects on the brain stem and medulla. Ball and ring hemorrhages, too, have been a feature, and remarkable "showers" of polymorphonuclear leucocytes. After a careful and specific study of the minute pathology of several of these cases, Weston Hurst *et alii* separated out this variety and called it "acute hemorrhagic leucoencephalitis". It seems very like the lesion in a series of some twenty cases of Baker's in Minnesota. Recently, it seems, cases have been reported in Great Britain, and naturally we have been on the watch for similar cases. Indeed, several brains have been sent us with such a diagnosis. During visits to Sydney, Hurst has shown us Pal-Weigert celloidin and iron Van Gieson sections from some of his cases, as well as from equine brain conditions from the United States of America. On his last visit we were able to show him some sections from a case we had in hand, and he at once expressed the opinion that this case resembled in both history and neuropathological findings the type of lesion on which he had been working in Adelaide.

Clinical Record.

I.J., a girl, aged seven years, was admitted to the Royal North Shore Hospital of Sydney on October 14, 1942. A cold and cough had developed three days previously. That evening she had vomited after the evening meal, and next day, feeling listless, she had asked for breakfast in bed. During the morning she was feverish and later her eyes became "stary". She became limp and could not speak distinctly. The next day she lost the use of her limbs, especially her right arm and left leg. She was unable to call or attract attention; she could comprehend but not respond. Some eye movements were present, and she could swallow fluids which were put in her mouth. She had not complained of headache. After a restless and disturbed night she was admitted to hospital. Previous to this illness the patient had been in good health. Her two younger brothers had developed measles one week before the onset of her first symptom. She herself at the age of four months had had doubtful measles, and at the age of six years she had contracted mumps. A fractured right radius had been treated by open operation at seven years; she had had frequent hemorrhages from the nose.

Physical examination revealed the child to be drowsy and semi-delerious; her eyes continually moved about. Her tongue was coated. Her heart was normal. Some dullness to percussion was noted over the base of the left lung, and the breath sounds were bronchovesicular all over the chest; scattered rhonchi were heard everywhere, especially at the base of the left lung. The liver was slightly enlarged to palpation and percussion. The pupils reacted to light. The tendon reflexes were as follows: the right biceps reflex was absent, the left was present; the right knee jerk was present, the left was "doubtful". The abdominal reflex was absent; the right planter reflex was absent and the left was normal. The right arm was paretic and the right leg flaccid; the left side was unaffected. The temperature was slightly elevated; it varied between 97.8° F. and 99.6° F. The day after her admission to hospital the right pupil became contracted, but towards evening it dilated till it was equal to the left. The systolic blood pressure was 110 millimetres of mercury and the diastolic pressure was 60. As she was not taking fluids, a Murphy's drip administration was started. In the early hours of October 16, 1942, her breathing became rapid and shallow, and the child died after unsuccessful attempts at resuscitation with "Coramin" and oxygen. Lumbar puncture yielded ten cubic centimetres of clear fluid under increased pressure; on examination this was found to contain 200 cells per cubic millimetre, 90% being neutrophile cells. In a direct smear from this fluid moderate numbers of neutrophile cells, but no organisms, were found; the fluid proved sterile. The protein content was 30 milligrammes per centum, the glucose content 65 milligrammes per centum, and the chloride content 763 milligrammes per centum. No Klebs-Löffler bacilli were found in a throat swab.

Post-Mortem Report.

The body was that of a thin child, sun-tanned all over. The skull was of moderate thickness, and there were two areas of translucent bone on either side of the sagittal suture. The meninges appeared congested, the convolutions flattened out and the pia-arachnoid slightly thickened especially at the base. The thyroid gland was not enlarged, and a well-developed thymus gland was present. The lungs were voluminous and pale pink, darkened areas being present posteriorly. The heart, its valves and the great vessels and cavities were also normal. The liver, gall-bladder, spleen and pancreas presented no special abnormalities; the liver

weighed 702 grammes. The stomach and intestines, bladder and genitalia likewise called for no comment, and the kidneys and ureters were normal. The brain in view of the clinical signs was kept for special investigation.

The brain was received in 10% formalin solution. A horizontal cut was made through the cerebral hemispheres at about the level of the *corpus callosum*. At once it was recognized that the left hemisphere was grossly swollen and presented a remarkable primrose-yellow discoloration, except where hemorrhagic areas obtained and where complete disintegration had produced a greenish, translucent, mottled, honeycombed appearance. The right hemisphere appeared normal, and a few rusty areas noted afterwards on microscopic examination were found to be of no importance. In fact lesions crossed the mid-line only for about a centimetre of the splenium. The lesions regressed anteriorly, and except in two places the grey matter seemed entirely to escape, as did also the "U" fibres, which stood out as gleaming white lines (Figure 1). The boundaries of the areas affected seemed to be from most of the occipital pole except the tip to the anterior end of the insula, thence to the basal ganglia and in depth to within an inch or less of the base and top of the cerebrum. The microscope revealed "cell reactions and invasions" far beyond this. For instance, the process involved both sides and the several components of the stem and the pons, and extended to the middle of the medulla and along the cerebellar peduncles to the utmost

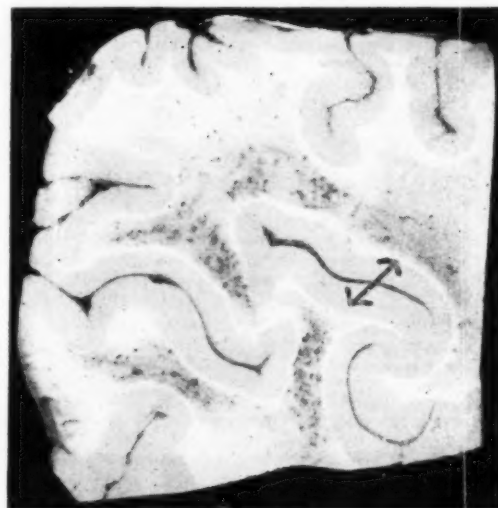


FIGURE 1.

Untouched photograph of a horizontal section of the occipital region. The dark hemorrhagic spots and the altered tints of the affected parts as well as the clear white demarcation of the "U" fibres (arrows) are well seen. (x 1.5.)

folia of the cerebellum and the pia-arachnoid in a few places; areas were recognized in the grey cerebral cortex, besides a few wedge-shaped areas of cortical neuronc degeneration, possibly on a vascular basis.

The stains used were hematoxylin and eosin, iron hematoxylin and Van Gieson stain, Weigert-Pal stain, the Mallory stains, Nissl's stain, *Scharlach R*, and the silver methods of Bielschowski, von Braunmühl, Cajal and the Rogers-Foot stain. Besides cerebral cortical and *centrum ovale* sections, some sections were taken from the lenticular nuclei, the brain stem, the pons, several levels of the medulla and spinal cord and many cerebellar areas. Now some of the areas of demyelination in Hurst's cases, in which the Weigert-Pal celloidin method of staining was used, were small and defined only by a standard technique. Hurst placed us deeply in his debt, therefore, when he offered to have pieces of the cerebrum and cerebellum from our subject stained by his standard technique. Photomicrographs of some of these sections are included in our illustrations.

Thus when naked-eye and microscopic appearances were combined, in the Pal sections patchy large and small areas of demyelination were found all over the *centrum ovale* (left side), together with spots of hemorrhage and honeycombed areas of more complete disintegration, quite

gelatinous, running up the white matter of the gyri. The likeness to Schilder's disease is therefore striking. Such areas were absent from the cerebellum, save for some general paling in its white centre near the dentate nucleus, and for areas of paling round some vessels, which were often due to aggregations of invasive cells there. The higher powers of the microscope revealed medium-sized and small blood vessels whose walls were thick by imbibition, or by cell proliferation of the walls, or by adventitial or perivascular collections of such cells as polymorphonuclear leucocytes (this feature either here or scattered extravascularly was



FIGURE II.

Celloidin Weigert-Pal section of cerebral cortex and part of centrum ovale. Both the spots and larger areas of demyelination (white) are visible. The arrow points to some hemorrhages, and at C the demyelinating process reaches the grey matter. ($\times 3.0$.)

not so prominent as in Hurst's cases), *Gitterzellen* large and small, recent and more aged, endothelial cells, and even erythrocytes. Large neuroglial cells were not so prominent as in the cerebellum, however, where in the white matter they were a prominent feature. Sometimes the vessels seemed to be disintegrating, but this too was more a feature of Hurst's cases. Ball and ring hemorrhages were common, as well as scattered red cells further afield not related to any visible vessel. Myelinated fibres were at times pushed aside by the numerous invasive cells, and at other times

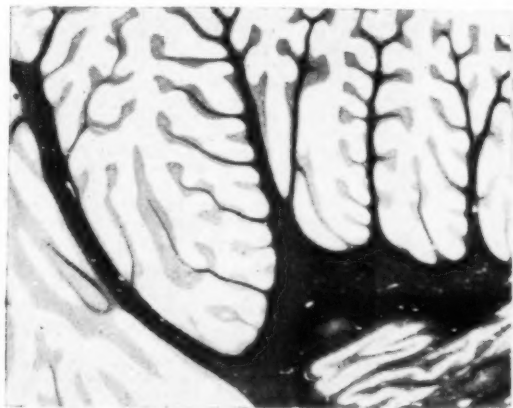


FIGURE VII.

Weigert-Pal celloidin section of cerebellum near dentate nucleus (at right bottom corner). No gross demyelination is visible, yet cellular infiltration or reaction is seen microscopically to the utmost folium. ($\times 10$.)

lost their myelin while passing through a zone of the demyelinating influence, and in more extreme cases myelin, axis cylinder and all ceased as one entered an area of extreme liquefaction. *Scharlach R* showed up the hosts of *Gitterzellen*, some too necrotic to exhibit any form or quality. In one or two places the process had invaded a minute patch of cortex and in scattered parts the pia-arachnoid also contained these adventitial cells. Strands of glial framework often outlasted myelin loss, but at times these, too, failed. The remarkable escape of the "U" fibres

rounding off the grey cortex at the bottom of the sulci was almost constant. Save for some of the invasive cells, the central nuclei escaped, and in the stem, from pons to mid-medulla, only various invasive cells and patchy hemorrhages were found. However, the middle portion of the medulla was much more widely affected in all parts, and if one can trust the myelin staining, which was carefully done by both Hurst and ourselves, then paling to decoloration of the myelin in certain tracts in the lateral regions obtained, and it was noted that this was most pronounced where the cellular reactions were most florid. In the cord a few swollen axis cylinders in the lateral regions alone bore witness of the extreme trouble in the brain. Similar swollen axis cylinders were observed in the brain stem, as, for instance, in cerebellar peduncles and in the demyelinated areas, near which also beaded appearances were observed in the myelin. A peculiar, rather wide paling of the central myelin not far from the dentate nucleus obtained. It is difficult to be quite sure that this represents a partial demyelination, and certain other and smaller pale spots were certainly due to aggregations of invasive cells round vessels. Yet microscopically it could be shown (specially by Mallory's triple stain) that the white matter had been densely invaded to the uttermost folia. In places the pia had been invaded. The molecular layers were healthy. It was considered that in many of the Purkinje cells mild centripetal reactions (swelling of the plumes or antlers) had occurred, with a little hypertrophy of the Bergmann glia. The layer of granule cells, too, escaped, save for a narrow area bordering on the myelin core. In this latter, besides many neurological cells, fibres, perivascular glia and adventitial cells, the main type of invading cells seemed to be varieties of *Gitterzellen* of all shapes and sizes, age and staining qualities. In Figure IV the dark-staining *Gitterzellen* are conspicuous. Many held granules and others just indefinite masses. In some respects—for example, the glial picture—the cerebellar state not only differed from the demyelinating picture in the cerebrum, but seemed to suggest a different age. This cellular picture at least links up some of the demyelinating states. To recapitulate, then, Hurst's description in one of his paragraphs seems suitable for the neuropathological findings in this case:

Microscopically the hemorrhagic lesions so arresting to the naked eye were overshadowed by other changes present over a much wider area of the nervous system. Indeed, they existed only in large numbers in and around the areas of most severe damage in the centrum semi-ovale. The other changes included oedema, widespread damage to the vessels and perivascular tissues, destruction of the myelin sheath, leucocytic invasion of the nervous parenchyma and proliferation of the microglia; the varying severity and combinations of these changes produced many different microscopic pictures.

It remains to be added that demyelinating diseases are being looked for and recognized more readily than formally. Some five or six years ago Holmes & Court and one of us (O.L.) described the second case of Schilder's disease in Australian literature. Dr. A. J. Canny later asked us to look at slides from two of his cases; soon two more brains came along in proven cases of Schilder's disease, and then Dr. R. D. K. Reye not only brought some excellent slides from four cases of his own, but assured us that he knew of three more. In this connexion one of Dr. Reye's slides proved of considerable value, in that it illustrated an extreme degree of neuroglial metamorphosis or hyalination or cloudy swelling; ordinary glial fibres supporting or leading to the pia or forming the glial vascular barrier had become thick bars. Thus another feature was added to the neuropathological picture of a demyelinating disease. Finally a suggestion has been made that in view of the doubtful history of measles in the patient's infancy, as well as its occurrence in two siblings just about the time of her last illness, the patient was in fact the victim of encephalitis following measles; the first attack perhaps modified in some way the whole process in the second attack, if indeed she had a *forme fruste*. For more minute details of the histopathological findings in acute hemorrhagic leucoencephalitis, Hurst's original article should be consulted.

Summary.¹

A case of acute hemorrhagic leucoencephalitis has been described in a female child whose siblings were suffering

¹ Since this record was completed three or four cases from children, 14 days, 33 days and several months old have come to hand presenting somewhat similar features clinically and pathologically, including one with both pyramids affected from internal capsule to the lower part of the medulla.

from measles at the time. The neuropathological findings have been examined and appear to conform to those of the Adelaide cases. Professor E. Weston Hurst concurs in this statement.

Acknowledgements.

To Professor Weston Hurst we must again express our indebtedness for personal help in our laboratory, for his slides, and for many letters of instruction, explanations and literature; we are also grateful to Mr. Woodward Smith, who took special pains with our slides, and to Miss Davison, B.Sc., for her part in the slide preparations.

Bibliography.

- M. E. Chinner: *THE MEDICAL JOURNAL OF AUSTRALIA*, June 5, 1943, page 520.
 W. S. Dawson and O. Latham: "A Case of Encephalomyelitis", *THE MEDICAL JOURNAL OF AUSTRALIA*, August 22, 1931, page 236.
 E. W. Fairfax and O. Latham: "Acute Disseminated Sclerosis Accompanied by Polio-Encephalitis", *THE MEDICAL JOURNAL OF AUSTRALIA*, April 30, 1932, page 621.
 J. F. Flashman and O. Latham: "A Contribution to the Study of the Aetiology of Disseminated Sclerosis", *THE MEDICAL JOURNAL OF AUSTRALIA*, September 18, 1935, page 265.
 A. W. Holmes & Court and O. Latham: "Schilder's Disease", *THE MEDICAL JOURNAL OF AUSTRALIA*, July 27, 1935, page 117.
 A. M. Litvak, I. J. Sands and H. Sibel: "Encephalitis Complicating Measles", *American Journal of Diseases of Children*, February, 1943; abstracted in *THE MEDICAL JOURNAL OF AUSTRALIA*, May 22, 1943, page 468.
 C. Swann: "A Case of Human Encephalitis with Type 'A' Intracellular Inclusion Bodies", *THE MEDICAL JOURNAL OF AUSTRALIA*, May 15, 1943, page 437.
 R. J. Taylor: "Meningo-Encephalitis following German Measles", *THE MEDICAL JOURNAL OF AUSTRALIA*, October 9, 1937, page 604.
 E. Weston Hurst: "Acute Hemorrhagic Leucoencephalitis: A Previously Undefined Entity", *THE MEDICAL JOURNAL OF AUSTRALIA*, July 5, 1941, page 1.

Reviews.

PSYCHIATRY AND THE WAR.

"PSYCHIATRY AND THE WAR" is a symposium by the leading psychiatrists of America, who were called into conference at the invitation of the University of Michigan and the Trustees of McGregor Fund.¹ Their deliberations have been edited by Dr. Frank J. Sladen, physician-in-chief of the Henry Ford Hospital in Detroit. The work opens with a discussion by Adolf Meyer on the means and scope of psychiatry. He points out the importance of a sense of responsibility. Psychiatrists must prepare themselves for leadership "now and here" in a broad individual and social setting, more particularly as at the present when we are "up against things".

The book is divided into five parts dealing with "The Philosophy of Psychiatry", "Research in Psychiatry", "Psychiatry in the Training, Experience and Education of the Individual", "Psychiatry and the War", and a review of the foregoing sections. There are forty-five contributors to the first four sections. Whilst there is an inevitable diversity of quality and an occasional surfeit of anecdote, the fare is surprisingly good. The book gives a broad view of psychiatry which has merit. Written by many specialists, it is free from the individual bias which is apt to occur when the scope of psychiatry is described by one man. The utility of the volume covers a wide field. The sections on the significance of psychiatry in internal medicine, surgery, paediatrics and geriatrics have a particularly broad appeal.

In "Psychiatry and Education" Dr. Burling pleads for the greater use of the psychiatrist.

If one allows himself to recognize the contrast between the potential wealth of personality which is housed in the school building with what actually is finding expression and a chance to grow within those walls, a visit to even a better-than-average school is a most depressing experience. After such a visit I have more than once found myself muttering: "After six thousand years wouldn't you think that we could have found something better to do with children than to put them into school?"

¹ "Psychiatry and the War: A Survey of the Significance of Psychiatry and its Relation to Disturbances in Human Behavior to help provide for the Present War Effort and for Post War Needs", edited by Frank J. Sladen, M.D.; 1944. Springfield: Charles C. Thomas. 9" x 6", pp. 526. Price: \$5.00.

This loss is very decidedly the concern of the psychiatrist, for we are more and more setting ourselves up as guardians of personality. Does our profession have anything to help the schools fulfill their functions more adequately? We can contribute in two ways, through psychiatric principles and through the actual presence of psychiatrists in the school system.

It is not surprising that emphasis is laid on the importance of the pre-school years. Dr. Hohman introduces his subject with the remark:

The central theme of my theory about child training is that as the twig is bent so is the tree inclined. I believe that the bending is done by the environmental milieu, and that we, the adults, are most largely responsible for what happens to our future adults. I hold that habit training is of paramount importance in all phases of childhood development and the transformation of childhood patterns into adult patterns. I hold this to be true for emotional and total personality reactions.

The optimist who sees an early end to the present war struggle will be sobered by Dr. Appel's contribution on "Psychiatry in National and International Relationships". He points out the importance of Axis propaganda in creating a strong enemy morale.

In the more specialized sections, there is an informative and interesting description of neurosis in aviators by Brigadier General Eugen Reinartz. An account of the results of prefrontal lobotomy by Professor Walter Freeman is distinctly encouraging. Describing his patients, he writes:

Most of them are now steady, industrious, undistinguished citizens; some are cheerful drones; some have slipped back into the world of fear from which the surgeon's knife temporarily rescued them; and three have succumbed in the first groping attempts of the surgeon to make their lives more worth living.

It must be remembered that this book is more than a book. It is the report of a conference, so there has been a double-barrelled avenue for publicity and enlightenment. The book is recommended for the Australian reader who is interested in the psychological approach to medicine and to life. The success of the conference in stimulating thought and crystallizing opinion is surely sufficient to suggest to the Australian psychiatrist the need for a conference on similar lines.

ELECTROTHERAPY.

In view of the widespread applications of electrotherapy, and its extension to the treatment of war injuries, the "Technic of Electrotherapy" by Osborne and Holmquest¹ is of special interest. The authors, of the Physical Therapy Department of the Northwestern Medical School, have adopted a novel method of presenting the physical and physiological bases of electrotherapy which should attract the specialist and the student alike.

In the first section of 100 pages the reader is led through experiments which he can perform with his own equipment to an appreciation of the physical, chemical and clinical effects of simple direct currents. This is followed by detailed descriptions of the methods of treatment of various surfaces by ionic transfer, complete prescriptions, and bibliographies of relevant papers.

Approximately seventy pages are devoted to pulsating currents and their use in muscle stimulation. The discussion of the treatment of various muscular and nervous disorders is characterized by a critical conservatism regarding the end-results.

The section of 140 pages on radiation includes thermogenic (heat producing) radiations, both visible and infra-red, and ultra-violet radiation. The general physical properties of radiation are treated thoroughly, yet simply, and include many experiments which the reader can himself perform. The various commercially available sources of radiation are discussed critically and their relative advantages and disadvantages enumerated. An interesting section deals with the question of the measurement of dosage of ultra-violet radiation, while the biological actions are discussed in detail.

It is, however, for the section of 430 pages on high frequency currents that the authors deserve special commendation. The physical principles and high frequency generators are developed simply and clearly (with the more difficult theory introduced in easily avoided footnotes), while

¹ "Technic of Electrotherapy and its Physical and Physiological Basis", by Stafford L. Osborne, M.S., Ph.D., and Harold J. Holmquest, B.S., B.S.(M.E.); 1944. Springfield: Charles C. Thomas. Publisher. 8 1/2" x 5 1/2", pp. 799, with many illustrations. Price: \$7.50, postpaid.

the usually disregarded question of the measurement of high frequency power receives special attention. The efficiency, from the clinical point of view, of the high frequency electric field (condenser electrodes) and the high frequency magnetic field (coil electrodes) is compared, the authors claiming that the latter is more satisfactory in achieving general heating of the vascular tissue. Detailed prescriptions for the treatment of various portions of the body are given for both methods together with numerous illustrations.

A comprehensive survey is made of the present position of knowledge regarding the special biological effects of high frequency radiation. In particular, the general physiological effects of artificial fever are discussed in detail.

The book is thoroughly up to date, excellently produced, and well illustrated. The extensive bibliographies contain references to English and foreign journals as well as to American periodicals.

THE PATHOGENESIS OF TUBERCULOSIS.

To all interested in tuberculosis the pathogenesis of the disease must always be a problem of absorbing interest. In "The Pathogenesis of Tuberculosis", Arnold R. Rich presents a comprehensive and highly critical survey of this very important subject in all its aspects.¹ The evidence on which present conceptions have been based is analysed, and the author's own views are stated reasonably and only after a judicious presentation of all the argument; the gaps in our own knowledge are shown and the problems yet to be solved clearly indicated.

In a short review of a book of this size, specific comment must necessarily be short, and matter of interest and importance but lightly touched upon or omitted altogether.

Whether inherited resistance or the dosage of bacilli received is the major factor in determining which individuals will develop clinical tuberculosis, has long been a problem, the final solution of which awaits decision. That relatively few of the spouses of partners suffering from tuberculosis themselves develop the disease, while of children one or both of whose parents suffer from tuberculosis a relatively higher proportion become affected, has to many seemed conclusive evidence that inherited native resistance is the all-important factor. It is argued by Rich that in all surveys of so-called "marital tuberculosis" the incidence in the unaffected partner of acquired resistance consequent on an arrested primary infection in childhood is entirely overlooked; also no account is taken of the possible effect of age resistance. Regarding the disease in children of affected parents, how much the greater incidence is to be attributed to the greater exposure to infection, rather than to inherited weak native resistance, is still undetermined. For these and other reasons, from the point of view of inherited native resistance, it is considered extremely difficult to assess the significance of the relatively low incidence of "marital tuberculosis" and the relatively higher incidence of tuberculosis in children whose parents suffer from the disease. The Lubeck disaster in which 251 newly born infants were accidentally infected with large numbers of virulent tubercle bacilli, is recalled. The fact that 175 of these children were alive four years later, many showing enormous amounts of calcification particularly in the abdominal glands, is evidence for the importance of inherited native resistance. The author's view is that native resistance is of importance, but to what extent cannot be stated on present evidence. The mechanism of resistance is discussed. After entry into the body, tubercle bacilli find their way into the mononuclear phagocytes. In the case of the body with strong natural resistance, as happens when tubercle bacilli of human type are introduced into the body of the rabbit, proliferation is strongly inhibited within these cells; in the case of the highly susceptible body, proliferation is unchecked. This is the one fact which stands out amid a welter of negative evidence.

Acquired resistance to tuberculosis is a subject concerning which many views have been held. The view is supported that infection with virulent tubercle bacilli or vaccination with attenuated or killed bacilli gives rise to a definite degree of acquired resistance, which plays an important role in limiting the incidence of clinical tuberculosis. Native resistance may be the native ability of the individual to develop acquired resistance. Virulence is held to rest in the ability of the bacillus to reproduce progressively. There is no qualitative difference between lesions resulting from

virulent organisms and those resulting from attenuated bacilli.

The mechanism of acquired resistance is the subject of much controversy. The author strongly attacks the view, which has had wide acceptance, that acquired resistance is closely bound up with the hypersensitive state. In a convincing argument the view is upheld that resistance and the hypersensitive state are entirely independent phenomena, either of which may exist in the absence of the other. Although absolute evidence is lacking, it is considered that specific antibody may be the important factor in acquired resistance. The suggestion is made that through the action of antibody the bacillus is so affected that it is more readily destroyed by the mononuclear phagocytes.

The still undecided question whether reinfection is always or usually exogenous, or whether it has its origin in an arrested primary complex in which living bacilli have persisted, is discussed. It is shown that both types of reinfection may occur, but it is considered that the evidence is inadequate for a decision to be made which is the more important mode in natural reinfection in the human subject.

In regard to the question whether an arrested primary infection gives protection against the development of clinical tuberculosis, it is shown that the one known relevant fact is that, of those in whom a primary infection is arrested, the great majority never develop the disease in its clinical form. It is stressed that any protection afforded is not stable and may be upset by any of the factors that adversely influence resistance.

The hypersensitive state that develops in the body following the initial infection with tubercle bacilli is thoroughly reviewed. The tuberculin reaction is held to be an antigen-antibody reaction, although this view awaits final proof. In a general discussion of hypersensitivity, in order to illustrate the confusion of terminology which exist regarding this subject, the author quotes a writer who was responsible for the following: "This form of anergy represents the highest form of hyperergy."

The scantiness of the present knowledge concerning the chemistry of the tubercle bacillus comes under review; for example, although it is known that the establishment of the hypersensitive state which follows the introduction of tubercle bacilli into the body is dependent on the protein fraction of the bacillus, yet all attempts to establish this state by the use of any of the proteins so far isolated from the bacillus have failed.

A view which has had some acceptance is that the lipid fraction of the bacillus forms a protective capsule, to which is attributed the well-known fact that bacilli may persist in the body for very long periods of time. It is held that there is no evidence to support this opinion.

As regards the general quality of the book, the writer's style is lucid and easy to read; there is an absence of typographical errors and the quality of the paper is good. "The Pathogenesis of Tuberculosis" should be read by all whose work is concerned with tuberculosis in any of its aspects, whether as clinician, pathologist or public health officer.

MODERN PHOTOGRAPHY AND ANCIENT SURGERY.

THERE is something of novelty in the idea which prompted Lejaren 'A' Hiller to illustrate the history of surgery through his undoubted gift as an accomplished photographic artist. The seventy delightful photographs which adorn his book "Surgery through the Ages" compel admiration for his consummate skill in composition, his mastery of the technicalities concerned with lighting effects, and the care with which he has selected his costumes to conform with the period he wishes to illustrate.

On the page facing each picture his collaborators, Paul Benton and John H. Hewlett, provide an abbreviated historical sketch relating to the subject, but the context is not always helpful to the reader who may be curious to know what action or incident the artist has endeavoured to portray. To one interested in the history of surgery this book should have a definite entertainment value, even though his attention is frequently distracted by a sequence of typographical errors—many of small consequence until we find a certain gentleman treating a patient "circa 600 B.C.", while the text states that he lived "about 600 A.D.". Even the great Methuselah failed to equal that record. And there is

¹ "The Pathogenesis of Tuberculosis", by Arnold R. Rich, M.D.; 1944. Springfield: Charles C. Thomas. 10" x 6½", pp. 1032, with illustrations. Price: \$10.50, post paid.

² "Surgery through the Ages: A Pictorial Chronical", by Lejaren 'A' Hiller; Text by Paul Benton and John H. Hewlett, with an introduction by Iago Galdston, M.D.; 1944. New York: Books, Incorporated, distributed by Hastings House. 10" x 8", pp. 189, with many illustrations. Price: 27s. 6d.

surely something amiss about the reference to "the invasion of Alexander the Great into India in the Fourth Century A.D.". Equally inconsistent is the over-exposure of so many beautiful female figures with ample breasts and graceful curves, if we are to believe that the ecclesiastical authorities regarded such brazen displays of immodesty as anathema from the early middle ages onwards.

The picture of Trotula and some of the "ladies of Salerno" attending a heavily clad woman in childbirth is accompanied by a statement which would seem to perpetuate the ancient legend that this famous woman physician had actually existed in the flesh; in fact "was the first woman physician in Europe of whom we have any clear and definite knowledge". This is far from being the case; it is simply a romantic story which has been completely dissipated in the cold light of history.

The last picture in the book is a representation of the operating theatre in the Massachusetts General Hospital in Boston featuring a smart and attractive young nurse all ready to assist at the operation. In these modern times one shudders at the thought of the type of nursing assistance that was available in the forties of last century when Morton first administered ether to produce anaesthesia for Dr. John Collins Warren at Boston. On the opposite page the authors say: "When the patient opened his eyes he exclaimed to the attending surgeons, 'Gentlemen, this is no humbug.'" Historians insist that it was the surgeon, Dr. Warren, who gave utterance to this exclamation, not the patient. The words have more significance when we recall the painful experience of poor Horace Wells, a short time before in the same surroundings, when his effort to demonstrate the anaesthetic properties of nitrous oxide gas ended in failure and the disappointed onlookers cried out: "Humbug."

If, as the publishers state, the photographer took many years to attain perfection in his pictures, surely a little more time might have been given by the writers to a careful scrutiny of the text.

ARTIFICIAL PNEUMOTHORAX.

A SHORT monograph on "Artificial Pneumothorax" by T. N. Rafferty, of Phoenix, Arizona, can be recommended to all who undertake the treatment of pulmonary tuberculosis.¹ Even the experienced physician may be refreshed by its succinct and up-to-date and balanced presentation of the subject. The actual technique of establishing and maintaining pneumothorax is not described in the book: the author points out that "the mere ability to introduce air safely is no qualification to administer pneumothorax"—it is careful adherence to the basic principles of management that determines the effect of the treatment on prognosis. Exposition of these basic principles and a consideration of the place of ancillary methods of treatment, especially closed intrapleural pneumolysis of which he is an enthusiastic advocate, are the author's chief aims. Emphasis is laid on the importance of an early and correct decision as to whether permanent or temporary collapse of the lung is necessary in any given case, and this question is well discussed, as are the indications and contraindications of pneumothorax treatment. Except for the inartistic arrangement of the gold lettering on the back, this is a handsomely produced little volume, well printed on good art paper.

Notes on Books, Current Journals and New Appliances.

AUSTRALIAN POETRY.

Most of the readers of this journal who have a love of literature will wish to see the work of Australian authors flourish. Appreciation is the best possible stimulus to good work—in literature as in any other sphere; and it has well been said that a flourishing band of writers demands a large body of readers. There is thus every reason why the recent publication of some volumes of Australian poetry should be noted.

¹"Artificial Pneumothorax in Pulmonary Tuberculosis, Including Its Relationship to the Broader Aspects of Collapse Therapy", by T. N. Rafferty, M.D., with an introduction by Henry Stuart Willis, M.A., M.D.; 1944. New York: Grune and Stratton. 8½" x 5½", pp. 208, with 26 illustrations. Price: \$4.00.

Kenneth Slessor's work is well known and has been before the public for more than twenty years. A book of one hundred of his poems has been published.¹ Those selected are put into three groups according to the dates of their publication; they were composed between 1919 and 1939.

He writes to himself:

After all, you are my rather tedious hero;
It is impossible (damn it!) to avoid
Looking at you through key holes.
But come! At least you might try to be
Even, let us say, a Graceful Zero
Or an Eminent Molecule, gorgeously employed.

He has indeed become more than a graceful zero—graceful, yes, but also virile and compelling. And his eminence is much more multicellular than molecular. On account of its medical interest his "Advice to Psychologists" must be quoted:

You spies that pierce the mind with trenches,
Feasting your eyes through private panes,
Who, not content with Heavenly stench,
Insist on taking up the drains,
For you I've only two suggestions.
Who prowl with torches in this Bog—
Small good you'll get from asking questions;
Walk on your nostrils, like a dog.

An anthology of Australian poetry for 1943 contains poems selected by H. M. Green.² It is a mixture, and most of the poems will arouse interest, if not appreciation. We read offerings so different as "Elegy", by R. G. Howarth; "Chanty", by I. R. Maxwell; "The Fishers", by Brian Vrepoint; "The Return from the Freudian Islands", by A. D. Hope; and "The City", by Gavin Greenlees. And there are many others.

A volume quite different is "Spright and Geist", by "R.G.H."³—initials which in no way hide the identity of the author. It comprises twenty-five short poems introduced by "Spright":

So long admired, yet till to-day
The final beauty lay unseen:
Against the deep-dyed sea your eyes
Are lucent green.

Token: what loveliness of soul,
Unglimpsed, will shine, when I regain
My spirit's sight, and once more know,
Beyond, the main!

Each of the poems is complete in itself as a love song. Their *Geist* is on a lofty plane and is serenely beautiful. The last one is this:

Why do I in travail live
And so with words and verses strive?
That once alone I may achieve
A pure expression of my love.
No phrase unworthy her shall stand,
No image formless as the wind:
I would perpetuate her mind,
Even as my love's life knows no end.

Kenneth Mackenzie's "The Moonlit Doorway" is a poem which gives the name to his volume.⁴ In these poems he sings of love which burns with a pure white calcining flame of passion that illumines the beauty of the thoughts and words. From so much that could be quoted from this attractive volume the first of "Eight Sonnets" must suffice.

You have disturbed my conscience and my soul
with words and looks and gestures: you have been
my hauntress, sleeping, waking, part and whole
of thought, being, will. I have now seen
it cannot do much good to one or other
for me to talk so, or to be like this—
lit with a passion that I would not smother,
fed by the stuff of a remembered kiss.
And yet the inward tears still well and flow
because love must be lonely as a star
seeing itself mirrored in pools below
the chilly heaven where its fellows are.
So, to my conscience and my soul, my heart
is speechless as love's very counterpart.

¹"One Hundred Poems: 1919-1939", by Kenneth Slessor; 1944. Sydney: Angus and Robertson Limited. 7½" x 5", pp. 131. Price: 5s.

²"Australian Poetry, 1943", selected by H. M. Green; 1944. Sydney: Angus and Robertson Limited. 7½" x 4½", pp. 62. Price: 3s. 6d.

³"Spright and Geist", by R.G.H.; 1944. Sydney: Angus and Robertson Limited. 7½" x 4½", pp. 29. Price: 2s. 6d.

⁴"The Moonlit Doorway: Poems", by Kenneth Mackenzie; 1944. Sydney: Angus and Robertson Limited. 7½" x 4½", pp. 95. Price: 5s.

The Medical Journal of Australia

SATURDAY, FEBRUARY 10, 1945.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

THE DECLINE OF THE BIRTH RATE.

THE most important item for discussion on the agenda of the eighteenth session of the National Health and Medical Research Council, held at Canberra last November, was the decline of the birth rate. A good deal of preparation had been made for the discussion, and the Council had before it several documents, some of which were completed studies and some interim statements. After discussion of these documents the Council prepared an interim report. This report, made available to the journal through the courtesy of Dr. F. McCallum, the Acting Chairman, is published in *extenso* in this issue. The first thing to be noted about this report is that the studies and interim statements enumerated in it cover a very wide field; no aspect of the question appears to have been overlooked. That 1,400 letters have been received by the Director-General of Health from Australian women stating their views on the subject and the reasons why many of them restricted the number of their children, adds a human touch to the investigation, even if its value from the scientific point of view is called in question. Though it may be argued that 1,400 is a very small number in relation to the female population of the Commonwealth, and though it is possibly true that among the 1,400 many would be included who had their pet ideas on the subject and were only too ready to make them public with the slightest encouragement, some of the statements included in Dr. Cumpston's "Annexure G" are most illuminating and bear the stamp of sincerity. In this matter of the declining birth rate it is essential to keep a sense of proportion, and this applies to medical readers just as much as, if not more than, to others. In this issue there are published several papers dealing with the question of sterility in women and in men. From the amount of space given to these articles and from the relatively small space allotted to the National Health and Medical Research Council's interim report it would be easy to attach too much importance to the role of sterility in the decline of the birth rate. Sterility is but one small aspect of a

subject that is replete with questions having a bearing on sociological medicine. But whereas many of these questions are the concern of the non-medical as well as of the medical sociologist, sterility is purely a medical question and no one but medically trained people can investigate or do anything about it. The chief fact therefore to be impressed equally on medical and non-medical people is the statement in the interim report that the two important factors responsible for the great growth of deliberate birth control are the decreasing dependence of women and the increasing sense of insecurity—economic and psychological, social and international. Remembering this fact, we may consider first of all the chief points in "Annexure D" and then refer shortly to the general sides of the subject.

The members of the medical committee appointed by the Council were: Professor R. Marshall Allan (Chairman), Professor B. T. Mayes, Professor H. Priestley, Dr. Ida Saunders, Dr. Kathleen Winning, Dr. A. M. Davidson, Dr. F. W. Clements and Dr. A. J. Gibson. The terms of reference of the committee were so wide that it was impossible in the time available for its members to investigate all the matters referred to them. The document produced by them is therefore only an interim statement. The committee's first act was to discover which hospitals would be prepared to set up a suitable sterility clinic and to cooperate in a survey. A statement on the requirements of a sterility clinic was sent to hospitals in the several States. After replies were received the committee thought that clinics could be established at the following nine hospitals: the Women's Hospital, the Royal Prince Alfred Hospital and the Royal Hospital for Women at Sydney; the Women's Hospital, Queen Victoria Memorial Hospital for Women and Children and Saint Vincent's Hospital at Melbourne; the Brisbane Women's Hospital; Perth Public Hospital; Royal Adelaide Hospital. The committee recognized that financial help would be required to set up the proposed clinics. It therefore recommended that a special grant of £300 should be made to each of the participating hospitals, and expressed the opinion that this sum would cover most of the expenses of a two years' investigation, though in certain cases a supplementary grant might be necessary. We understand that the Council accepted the recommendations of the committee in regard to the establishment of the clinics and the payment of subsidies to them. The formal approval of the Minister will still be required. The committee tried to investigate the use of contraceptives and abortion, and for this purpose devised a special questionnaire. About 8,000 cards were sent out to doctors who it was hoped would be able to cooperate in the survey. Only 584 cards were returned. It should be explained that one card had to be used for each patient. We read that one doctor contributed 21% of the total number of cards returned and that the number of doctors cooperating was not large. In the circumstances it was not thought worth while to summarize the results so far obtained. In regard to the incidence and cause of stillbirths and neo-natal deaths, reports were received from several investigators, but these will be considered at a later date. The authorities at the Women's Hospital, Crown Street, Sydney, and the Women's Hospital, Melbourne, have agreed to undertake a long-term investigation "to determine those factors associated with the wastage of potential children due to losses after conception". In

association with this work it is proposed to investigate the effect of improved diet on (a) the course of pregnancy, (b) the course of labour, (c) the convalescence of the mother, (d) the general well-being of the baby during the first six months of life. This investigation will be carried out "by supplementing the diet of a group of pregnant women and noting the effect on the four factors named". The details of the scheme have been drawn up by the Nutrition Committee of the National Health and Medical Research Council and its estimated cost is £3,000. Publication of these details will be awaited with interest, for such an investigation will be difficult and lengthy and will need to comprise a large number of women. An attempt was made to discover the wishes of women in regard to the question of domestic help during the later months of pregnancy and for about one month after delivery. Apparently there is a demand for housekeeping help during this period. Inquiries were made from *multiparae* in metropolitan hospitals; 81% of more than 700 women stated that they would like to have help at some time of the period; 66% wanted the help before going to hospital; 69% wanted help after returning from hospital; and 35% wished to have help in the home during their stay in hospital. There is not such a large demand for a home to which children can be sent during the absence of the mother or soon after her return from hospital; only 21% expressed wishes in this direction. Only 16% wished to go to a rest home after their discharge from hospital.

The recommendations of the medical committee responsible for Annexure D will meet with the approval of the medical profession. There is no doubt that the establishment of sterility clinics will be a step in the right direction. The existence of special clinics will appeal to many persons who will go to them for advice and treatment, and who for one reason or another would not consult their own medical attendant, though he would probably be just as able as a member of the staff of a clinic to do, or to arrange to have done, for them everything that was needed. If all sterility was curable the birth rate might not show much of an upward trend, but many persons would be healthier and happier and they would lead fuller and richer lives. There is one proviso to this statement—that social conditions should be satisfactory. Clearly every effort must be made to cure sterility, even though the sterile are few in number. But sterile and non-sterile live in the same community and are subject to identical social conditions, and this brings us to the two important factors named by the National Health and Medical Research Council in its interim report—the decreasing dependence of women and the increasing sense of insecurity. Social conditions and the future have been discussed in these pages on previous occasions. We do not propose therefore to discuss the "four freedoms" in relation to this subject. It is important, however, to draw attention to the statement made by the interdepartmental committee in Annexure B that whether or not the plane of Australia's population will incline upward "seems to depend on the wisdom and effectiveness of measures that can be adopted to encourage a regrowth of family life". Although, as this committee points out, universal factors have effected a profound change in the attitude towards child-bearing of most European peoples in all parts of the world, this does not make the Australian problem any the less urgent. Australia needs not only an increase in its birth rate, which can be achieved in a

free and happy community if the people wills it, but also a population policy. The interdepartmental committee thinks that the high level of employment and industrial activity occasioned by the war may continue spontaneously for a few years after the war. It sees an opportunity to adopt in this interval policies designed to sustain both employment and industrial activity—"it is less difficult to sustain an upward momentum than to generate it". This is no doubt true, and every advantage gained must be followed and used to good effect. But employment and industrial activity alone will not make of Australia what all who love her wish her to be. Work and activity we must have, but they need a solid foundation, one based on understanding and tolerance, zest and cooperation, freedom and justice.

Current Comment.

NECROSIS OF THE LIVER.

ATTENTION was recently drawn in these pages to the important and interesting researches carried out on the lesions found in the liver of animals fed on a basal diet containing sulphaguanidine. It was found that the administration of liver extract was most effective in preventing liver damage in these animals. Similar results obtained by Faust in experimental hepatic amebiasis have also been the subject of comment. Further links in the chain of knowledge are now supplied by other workers. It has been known for some time that methionine or casein digest comprising this sulphur-containing amino-acid has a protective action on the liver of animals subjected to the actions of certain poisons. Miller and Whipple observed that the depletion of plasma proteins in dogs rendered them susceptible to chloroform poisoning, but that liver damage could be averted by feeding them with methionine. Recently J. Beattie and J. Marshall have published studies on the value of methionine and casein digests in preventing post-arsphenamine jaundice in patients treated for syphilis.¹ True, they were not successful in altering the overall incidence of liver damage, but they were able to shift the time of peak incidence of such damage to a later period in treatment, and to lessen its severity. They have recommended that dietary supplements are advisable in such patients as a prophylactic measure against jaundice. What would be more important still would be if we could prevent or control the course of hepatic necrosis from whatever cause it arose. The occasional occurrence of liver necrosis in infective hepatitis prevents complacency about this disease, quite apart from its great military importance, as both friend and foe have found. The reappearance of jaundice and of a not negligible number of cases of sub-acute atrophic necrosis of the liver following yellow fever inoculation in the last few years has further stimulated inquiry.

L. E. Glynn and H. P. Himsworth have recently attacked the problem in a direct fashion by experimenting with the production and control of massive acute necrosis of the liver in rats.² These authors have previously shown that a distinctive type of necrosis may be produced in the liver of rats. In this condition large tracts of liver cells are destroyed in a distribution which is curious, as it is not zonal or even regular, but may be localized, even to a single lobe. The essential feature of the faulty diet is protein deficiency, and the intake of carbohydrate, fat and vitamins exerts but little modifying influence. Not only this, but the degree and speed of necrosis closely parallel the degree of protein deficiency, and, further, the necessary protective factor is methionine, which is abundant in casein. Therefore casein will protect the animals from dietetic liver damage. All this would be purely academic

¹ *British Medical Journal*, November 18, 1944.

² *The Journal of Pathology and Bacteriology*, July, 1944.

if it were not for the interesting fact that the lesions thus produced in the rat are indistinguishable from those found in the human subject suffering from subacute or acute hepatic necrosis. Stage by stage the processes correspond; and both macroscopic and microscopic pictures are identical, with regard to cell destruction, infiltration and regeneration. Study of the experimental lesion by Glynn and Himsworth has shown that where insufficient casein is fed to the animal to ensure complete protection, lesser changes may be produced that are singularly constant in distribution and nature. The distribution points to the influence of an anatomical factor, concerned with blood supply. It is thought to be related to the fact that blood from the splenic and inferior mesenteric veins is distributed to the left lobes of the liver, and that from the superior mesenteric vein to the right lobes. As the latter carries the products of protein digestion first to the right side of the liver, it is reasonable to suppose that this is why this side is spared in cases of partial necrosis in animals.

Glynn and Himsworth point out that this type of necrosis of the liver differs both clinically and pathologically from that produced by many substances known to be toxic to the liver. This difference would be expected since the spoiling in the latter case is zonal owing to a more general distribution, and is not necessarily related to a specific deficiency. They record that a dose of 20 milligrammes per day will completely protect the rat from this form of deficiency necrosis. There are many links missing in the chain yet, but knowledge grows, and at least in cases in which there is reason to suspect that hepatic necrosis may occur, it seems logical at least to prevent this important and potentially dangerous deficiency by the administration of an adequate amount of protein, including casein.

The progress of knowledge about atrophic and necrotic changes in the liver has been rather back-to-front. Cirrhosis of the liver seemed once to be a settled subject; now it is merely an end station on a branch line. Acute yellow atrophy of the liver, so-called, aroused the spirit of inquiry more, and next the capacity of drugs, infective agents or other obscure hepato-toxic agents to produce a more or less severe necrosis stimulated research. Now we seem to be still nearer to the source of the disturbance, and it looks as if the riddle may be partly solved by studies on cellular nutrition. In spite of the difficulties and complexities met in the study of necrosis of the liver, some integration of the subject may perhaps be arrived at in the near future.

THE CONTROL OF OBESITY.

It is well known that in spite of the assurance that can be truly given to obese patients that they can lose weight, the results are frequently not permanent. Obviously there are many factors concerned in obesity, and not the least important of these are the social habits of the patients. T. S. Danowski and A. W. Winkler, in considering obesity as a clinical problem, have found that the relevant literature is concerned almost entirely with a description of methods and results over a relatively short period of time.¹ In fact they could find only one record of an attempt to study the results of treatment statistically over a long period. Realizing that it is well to face failure as well as success, they have recorded the results of studying 141 obese patients attending the metabolism clinic of the New Haven Hospital. These patients were of all kinds and included in their number diabetics, the subjects of other endocrine diseases, renal disease and various nutritional disturbances. In the last group were included patients referred for the specific purpose of what is optimistically described in the language of the day as slimming. One hundred non-obese patients were used as statistical controls. These patients were under treatment for the same conditions as the obese; the significant difference between the test group and the control group

was simply that the latter were not overweight. Danowski and Winkler checked the diagnoses by satisfactory criteria, and recorded also the presence or absence of certain other abnormalities such as varicose veins, arthritis and arterial hypertension, and in particular any evidences of cardiovascular breakdown. Few patients in the obese group were over sixty years of age, probably because of the less favourable effect of excess weight on longevity. No connexion was found between diabetes and obesity in this group because all the hospital diabetics attended the clinic, and thus the statistical loading of the diabetic figures made deductions erroneous.

It is interesting to note that varicose veins, though appearing in both test and control groups, appeared a decade earlier in the obese. There was also some tendency for gall-bladder disease to occur earlier. Symptoms of trouble referable to the joints were common in the obese; the authors think that this is due to the effect of greater weight in making minor changes clinically significant. Vascular disease was, of course, much more important. Hypertensive and arteriosclerotic diseases of the circulatory system were found much more frequently in the obese patients. A special investigation was made of the association between hypertension and obesity. The authors conclude from their figures that hypertension is relatively more common in the obese, that a reduction in weight usually is reflected in a fall of blood pressure, and that being overweight in itself exercises a bad influence on vascular disease once it is established. But most interesting is the frank discussion of the results of treatment. Three-quarters of their patients who lost weight under treatment eventually regained it. They considered the possibility of diencephalic or endocrine disturbances being responsible for these relapses, but they found no evidence that such causes were commonly significant. Food rationing has not helped to any degree because the carbohydrate foods are still the easiest to obtain. Since it is recognized that drastic caloric reduction in diet will assuredly cause loss of weight, but that it cannot always be maintained, the usual course followed is to stipulate a moderate caloric reduction over an indefinite period. But even this when followed by the patients does not in the experience of Danowski and Winkler result in maintenance of the weight at a lower level. Increased exercise has helped little, usually merely stimulating the appetite somewhat, and moderate dosage with thyroid substance has little effect on the person with normal thyroid metabolism and also was ineffective. The authors feel that these rather depressing considerations taken with their relative failure in keeping their patients' weight down are based on strictly scientific considerations, and they suggest that the more successful results reported by others might not be really so satisfactory if examined by very critical methods and over a considerable period of time. They think that the most hopeful method of treatment is to use an ordinary diet which will produce a small negative caloric balance, designed to produce a slow decrease in weight, and to be of such nature as to encourage the patient to continue it. The most significant finding in this study is that careful check on the results of dieting the obese has revealed what we all know in our hearts, that while it is easy to reduce a patient's weight to some extent, it is much more difficult to keep it down. This might perhaps be managed if the patient had an appropriate text concerning the value of not wearying in well-doing hung on the dining-room wall and directed his eyes thither at each meal. But Danowski and Winkler aptly observe that it is not merely a question of calories, but one of the patient's eating habits. They remark that "the procedure by which a particular patient is to be persuaded to alter his habits of eating must necessarily be individualized", but they do not tell us how it is to be done. Yet it is valuable to face difficulties candidly, and to realize that even after regulating the patient's caloric intake, considering his water and salt balance, and correcting any endocrine deficiencies, there are still factors concerned with his every-day manner of living that are important to consider and control. The control of excess body weight is important after all; it is a branch of preventive medicine, and its continued study is worth while, even though the results are not always encouraging.

¹ *The American Journal of the Medical Sciences*, November, 1944.

Abstracts from Medical Literature.

PÆDIATRICS.

Deficiency Diseases in Young Children.

TOM D. SPIES and GENEVIEVE DELFS EWING (*Archives of Pediatrics*, October, 1944) have during the past seven years studied 1,102 infants and children with uncomplicated dietary deficiency diseases in an endemic area. In many instances the mothers of these children had deficiency diseases which were more pronounced clinically during pregnancy and lactation. It seems probable that some of the infants began to develop deficiency diseases *in utero*. In these infants and children a period of general poor health, failure to gain weight, and a variety of ill-defined symptoms preceded the appearance of lesions diagnostic of pellagra, beriberi or riboflavin deficiency. This study on 200 selected infants and children with pellagra, beriberi and riboflavin deficiency showed that these lesions disappeared promptly following the administration of synthetic vitamins specific for the particular deficiency. To nursing infants the vitamins were administered directly in some cases, while in other cases they were given to the lactating mothers. Irrespective of the method of administration, the lesions in infants and children disappeared promptly, their appetites increased, and they gained weight. This gain in weight was maintained for varying periods of time, but unless the diet of the child improved, it often levelled off gradually. The authors conclude that synthetic thiamin, riboflavin and niacin amide are valuable supplements to a diet deficient in these substances, but they do not compensate for the deficiency of all nutrients in a generally inadequate diet.

Bactericidal Action of Penicillin on Bacteria Commonly Present in Infections of the Urinary Tract.

HENRY F. HELMHOLTZ and CHIEH SUNG (*American Journal of Diseases of Children*, October, 1944) present a detailed study of the bactericidal action of penicillin in urine on bacterial flora commonly encountered in urinary infections. Thirty strains of *Streptococcus faecalis*, 39 strains of *Escherichia coli*, 13 strains of *Proteus ammoniae*, 18 strains of *Aerobacter aerogenes*, 3 strains of *Pseudomonas aeruginosa* and 11 strains of *Staphylococcus aureus*, all originally isolated from the urine of patients with various infections of the urinary passages, were employed in the experiments. The authors draw the following conclusions. (i) For *Streptococcus faecalis* a concentration of three Oxford units of penicillin per cubic centimetre of urine is bactericidal. (ii) For *Proteus ammoniae* eight units per cubic centimetre of urine is the minimal bactericidal concentration. (iii) For *Escherichia coli* there seems to be a line of demarcation between the resistant and the susceptible strains at a level of thirty Oxford units of penicillin per cubic centimetre of urine. (iv) *Aerobacter aerogenes* and *Pseudomonas aeruginosa* are very resistant to the action of penicillin. (v) *Staphylococcus*

aureus has survived satisfactorily in the investigation as a control for the other organisms under study as to their respective resistance and susceptibility towards the action of penicillin. The growth of this organism itself is inhibited at a concentration of 0.033 Oxford unit of penicillin per cubic centimetre of urine. (vi) The bactericidal action of penicillin at the low level of its concentration in urine presents therapeutic possibilities for the treatment of infections due to *Staphylococcus aureus*, *Streptococcus faecalis* and *Pseudomonas ammoniae*. The resistance of *Escherichia coli*, *Aerobacter aerogenes* and *Pseudomonas aeruginosa* to penicillin practically rules it out as a means of treating these infections.

Hæmolytic Staphylococcus Pneumonia in Early Infancy.

AGNES MCBRYDE (*American Journal of Diseases of Children*, October, 1944) reports two cases of hæmolytic staphylococcus pneumonia in infants aged four and five weeks respectively. He points out that infection caused by pneumococci and by β -hæmolytic streptococci usually responds readily to adequate therapy with a sulphonamide compound. Staphylococci are much more resistant to sulphonamide compounds and death often occurs in a few days even when adequate doses of one of these drugs have been administered. The author has the impression that young infants with bronchopneumonia who do not make a dramatic response to such therapy in twenty-four hours should be treated with penicillin without delay. Cultures should be made, but the clinician should start treatment with penicillin at once without waiting for the report from the laboratory. The two patients in question were given sulphadiazine in adequate dosage for forty-eight hours before treatment with penicillin was started. Their condition became worse, and though the use of sulphadiazine was continued the dramatic improvement after penicillin was administered seemed to be due to that agent. The total amount of penicillin given the two infants was 41,000 and 50,000 units respectively. It seems logical to assume that even in severe infections the dosage of penicillin needed for the treatment of young infants is much smaller than that required by older children or by adults.

Reserves, Absorption, and Plasma Levels of Vitamin A in Premature Infants.

THOMAS H. HENLEY, MARGARET DANN and WALTER R. C. GOLDEN (*American Journal of Diseases of Children*, October, 1944) have carried out investigations consisting of three series of observations. First of all they studied the vitamin A in the plasma of twenty infants given a standard dose of vitamin A and made concomitant determinations of the excretion of fat by ten infants. Secondly, they determined the levels of vitamin A in the plasma of 89 premature infants at or about three weeks of age and their relation to birth weight and vitamin intake. Thirdly, they examined for carotene and vitamin A the livers of 23 infants who died at or shortly after birth. Tests for the absorption of vitamin A were performed on ten premature and ten full-term infants

between six and seventy days old by determining the rise in plasma level five hours after the ingestion of a test dose. Four premature and two mature babies had evidence of poor absorption. The full-term infants as a group showed higher elevations of the vitamin A level in the blood plasma after the test dose, and in both groups age seemed to favour increased efficiency of absorption. In ten infants, eight of whom were premature, retention and excretion of dietary fat were calculated from assays of faecal fat. In three of four infants with poor retention of fat, absorption of vitamin A was also poor, while all six infants who retained fat well absorbed vitamin A efficiently. Levels of vitamin A in the blood plasma were determined by a photomicrocolorimetric method for 89 premature infants at three weeks of age. The average values were of the same order of magnitude as those reported by other investigators for full-term babies, but a wider range was found. Birth weight was not a factor in determining the level of vitamin A in the plasma. The levels were significantly higher in infants who had received vitamin A supplements from the third day of life than in those not given vitamin A. Livers obtained at autopsy from sixteen premature and seven full-term infants who died within one day of causes not thought to have affected vitamin A, were assayed. Without exception mature infants' livers contained higher stores of vitamin A than livers of premature babies. The average amount in percentage was more than twice as great in the full-term infants, and the amount in the entire liver was more than five times as great. The authors conclude that because premature infants have relatively low reserves of vitamin A in the liver, because they are likely to absorb both dietary fat and vitamin A less efficiently than full-term babies, and because many premature infants not receiving supplements of vitamin A have low level in the blood plasma, deficiency of this vitamin may be expected to develop earlier in these infants. These results suggest that early supplementation of premature infants' diets with concentrates containing vitamin A is a desirable routine procedure.

Constrictive Pericarditis: Pericardial Resection.

R. S. PILCHER (*Proceedings of the Royal Society of Medicine*, August, 1944) presents the case of a girl, aged nine years, who on her admission to hospital had suffered from ascites for nearly a year; oedema of the legs was present. Her illness appeared to have begun about fourteen months previously with acute pericarditis. She had also suffered from bilateral pleural effusion. At the time of her admission to hospital she had orthopnoea, moderate cyanosis of the face and hands and intense cyanosis of the feet. Signs of constrictive pericarditis were obvious; the heart movement was diminished. Pericardial resection at first produced no improvement in the pulse pressure, although the heart was well released and cyanosis and venous engorgement were less; but fluid continued to accumulate in the abdomen. One month later she had an unexplained convulsive seizure lasting three hours, during which for the first time the systolic pressure rose to over 100 milli-

metres of mercury, and both systolic and diastolic readings were obtained by auscultation. During the seizures she was intensely cyanosed, and it was feared that she might have suffered some permanent cortical damage; her mental condition caused anxiety. However, recovery seemed complete. Her pulse pressure remained normal, but fluid continued to accumulate. Three months later again she was sent to a convalescent hospital; her abdomen began to shrink, and no further aspiration was required.

X-Ray Appearance of the Oesophagus in Normal Infants.

HARRY BEKWIN AND ELEANOR GALENSON (*American Journal of Diseases of Children*, October, 1944) point out that the wide shadow cast by the oesophagus of an infant in an X-ray film may readily lead to an erroneous diagnosis of cardiospasm. Furthermore, the presence of food in the oesophagus for some time after a feeding has been completed may be falsely interpreted as due to retention, especially if the subdiaphragmatic portion of the oesophagus is visualized as a narrow thread-like channel. It is therefore important to keep in mind that the oesophagus in an infant is distensible to a marked degree and that pooling of material in the lower portion for a considerable length of time after feeding is common and is ordinarily due to reflux from the stomach.

ORTHOPÆDIC SURGERY.

Translocation of the Peroneus Longus Tendon for Paralytic Calcaneus Deformity of the Foot.

W. H. BICKEL AND J. H. MOE (*Surgery, Gynecology and Obstetrics*, June, 1944) present the results of treatment by translocation of the *peroneus longus* tendon in thirteen cases of paralytic calcaneus deformity of the foot. The patients' ages varied from five to fifteen years; seven were male and six were female. All had suffered from poliomyelitis and had reached the "residual" stage. "Translocation" was described by von Baeyer as meaning the changing of the course of a tendon muscle preparation to perform a new function without severance of the origin or insertion of the muscle. The authors state that in their series of cases, which began in 1937 and was completed in 1942, all the thirteen patients complained of a calcaneus deformity, and seven had an associated valgus deformity of the ankle and foot. In four cases some cavus deformity was present. Before operation was undertaken, the muscle strength in all muscles of the leg was carefully evaluated. In the majority of cases operation was performed only when the strength in the peroneal muscle was rated as "fair" or better. In two cases the rating was "poor"; operation was performed, however, and in one case the result was poor, while in the other it was very good. The results in the series are classed as follows: "poor", three cases; "fair", two cases; "good", four cases; "very good", three cases; "excellent", one case. The peroneal tendon was reexplored in three instances; in two it was loose and in the third it was frayed out. In all cases the tendon was tightened, and

in two the strength of the *peroneus brevis* was added by transplantation onto the calcaneus. The results remained poor, and in one case an anterior bone block operation was later performed. Two of the poor results can be attributed to the transposition of a tendon too weak to be of value in its new function. One tendon became frayed out from what was probably an improperly prepared bed. No cause for the two other unsatisfactory results could be found. The authors consider that the results were satisfactory in a sufficient number of cases to warrant further trial of the method. The best results were obtained when the patient had slight remaining power in the gastrocnemius muscle and fair or better power in the transposed peroneal muscle. They believe that the results of this procedure are strikingly better than those obtained when the peroneal tendon is cut and transplanted into the *tendo Achillis* or calcaneus. The operation is described in detail.

Painful Shoulder due to Lesions of the Cervical Spine.

BERNARD N. E. COHN (*The American Journal of Surgery*, November, 1944) deals with certain lesions of the cervical spine which may cause a painful shoulder associated with radiation into the upper limb. He states that in hypertrophic arthritis of the spine, hypertrophic arthritis of the intervertebral articulations and thinning of the disk which results in narrowing of the intervertebral foramen, or either of them, is the basis of the root pain. The outstanding characteristic of this syndrome is the elicitation or aggravation of the root symptoms on hyperextension of the cervical spine. Flexion usually causes the pain to abate. The pain is relieved by traction on the neck with the head in flexion. Later a collar or brace may be used. Deep X-ray therapy is of value in these cases. Carcinoma metastasis and tuberculosis of the cervical spine cause root pain by compression of nerve roots. Herniated cervical intervertebral disks cause a syndrome in which the common symptoms are: (a) pain which may or may not be situated in the cervical spine with radiation to the shoulder, upper limb, scapula or precordium; (b) positive cough and sneeze sign; (c) spasm of the neck muscles. Associated sensory and reflex changes may be present. Surgical removal of the herniation gives immediate relief.

Pain and Disability of Shoulder and Arm due to Herniation of the Nucleus Pulposus.

POST J. MICHELSEN AND WILLIAM J. MINTER (*The New England Journal of Medicine*, August 24, 1944) report eight cases of herniation of a nucleus pulposus in the lower part of the cervical segment of the spine. There were lesions at the fifth cervical interspace in four cases, at the sixth in three cases and at the seventh in one case with unilateral involvement of the sixth, seventh and eighth cervical roots respectively. In spite of the differences in level, these cases had certain features in common. Pain, associated with paresthesia, was the main symptom. Exacerbating factors were movements of the neck and of the shoulder, sneezing and coughing. Abduction and external rotation of the shoulder with internal rotation of the forearm was

used by three patients to relieve the pain. Impairment of sensation in some parts of the upper extremity was recorded in seven cases. Weakness of certain muscles and diminution of arm reflexes were observed in seven cases, atrophy and fasciculation in four cases. In some cases mild signs of involvement of the pyramidal tract were found on the same side as the root compression syndrome. The authors suggest that cord compression as a diagnostic criterion of cervical herniation has been over-emphasized. Protein in the cerebro-spinal fluid was usually higher than normal. Lipiodol findings were normal in only one case. X-ray examination usually revealed narrowing of an interspace, hypertrophic changes and absent cervical lordosis. Herniation at the fifth interspace caused sensory manifestations over the scapula, antero-lateral aspect of the arm, cubital fossa, radial side of the forearm, thumb and index finger, together with motor signs in the deltoid and biceps muscles. Herniation at the sixth interspace seemed to involve the scapula, postero-lateral aspect of the arm, dorsal surface of forearm, index and middle fingers in sensory changes, and motor signs were present in the deltoid, biceps and triceps muscles. Herniation at the seventh interspace caused sensory manifestations over the scapula, inner side of arm and forearm, and little finger, and led to changes in triceps, *adductor pollicis*, *flexor digiti quinti* and interossei muscles. The involvement of the scapula in all these cases regardless of level was considered by the authors to be an overlap phenomenon or else a true representation of the affected roots in this area. They point out that the different outlines of dermatomes in text-books are extremely confusing. The results of removal of disk fragments by subtotal hemilaminectomy were good.

The Regeneration of the Semilunar Cartilages.

I. S. SMILLIE (*The British Journal of Surgery*, April, 1944) reports his observations in fourteen cases in which patients were subjected to a second operation in a series of 600 meniscectomies. One patient was subjected to arthrotomy six weeks after the original operation. After this short interval the anterior horn which had been removed previously was found to be completely reconstituted. When the entire meniscus is excised a new one grows in from the parietal synovial membrane, and it has much the same form and general appearance as the normal structure. Detailed examination permits the recognition of a regenerated meniscus. The attachment to the capsule is very dense. The new meniscus is thinner and narrower than normal. The fibrous tissue of which the new meniscus is composed has a glistening surface which is much whiter than that of normal fibrocartilage. Partial excision of a meniscus, provided the portion excised includes the peripheral zone, is also followed by replacement. The rarity of lesions of regenerated meniscus is explained by the differences in attachment and cross section compared with the normal. In all five cases of tears of regenerated meniscus reported by the author lesions of structures concerned with maintaining the stability of the knee joint were demonstrated.

Public Health.

THE NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL.

THE following is an interim report on the medical aspects of the decline of the birth rate, adopted by the National Health and Medical Research Council at its eighteenth session on November 22-24, 1944.

INTRODUCTION.

The Council at its seventeenth session in May, 1944, gave preliminary consideration to the decline in the birth rate in Australia, but emphasized the fact that there were some aspects of the problem upon which it was necessary that evidence must be collected, analysed and deliberately considered before any valid conclusions on the subject could be expressed.

As matters of common observation, however, some things were self-evident and were set down at that stage by the Council, though their exact consequences and the methods for their correction were regarded still as questions for study.

It was, for instance, clear beyond any doubt that the birth rate has for several decades been falling steadily and that the general rate of fall is such that if present conditions continue, no hope of a recovery and subsequent continued rise can be justified, and that the ultimate result of this continued fall on the total population of this country must be such as to cause, even now, the gravest anxiety about the future of the Australian people.

It was, moreover, clear, whatever the contributory considerations or the deciding factors, and subject to the fact that many married couples who greatly desire children find themselves involuntarily sterile, that the future of Australia and of the Australian people depends upon the individual decision as to child-bearing of each Australian woman.

In adding that there could be little doubt that there are many women who deliberately decide to limit their families or to have no children, and who, with that intention, employ contraceptives or suffer deliberate abortion, or both, the Council considered that it must collect whatever evidence was available as to the extent of such practices and the impulses that led women to follow or to reject them.

To assist its deliberations the Council set in motion various expert inquiries. The reports of these investigations are now to hand; some as completed studies and some as interim representations. Since they cannot be condensed without the risk of distortion, these reports are added to the printed report of the present session of this Council respectively as:

Annexure A.—"Some Aspects of the Social History of the Nineteenth Century as an Introduction to the Study of the Decline of the Birth Rate", by Margaret Macpherson, B.A.

Annexure B.—"Decline in Birth Rate and Future of Population: Interim Report", by S. R. Carver, Dr. R. Wilson and Dr. H. C. Coombs, on behalf of an interdepartmental committee.

Annexure C.—"Report of an Inquiry into what would Constitute a Fair Deal for Mothers, Infants and Young Children", by A. Constance Duncan, M.A.

Annexure D.—"Interim Report of the Committee of Inquiry into Medical Aspects of the Decline of the Birth Rate", by a medical committee set up for the purpose.

Annexure E.—"The Population Problem in Relation to the Personal Needs of Mothers", by Enid Lyons, G.B.E., M.H.R., and Phyllis D. Cilento, M.B., B.S.

Annexure F.—"Education and the Birth Rate", by K. S. Cunningham, M.A., Ph.D., for the Australian Council for Educational Research.

There have also been received and confidentially studied and extracted over 1,400 letters sent, in response to invitation, by Australian women themselves—individual and occasionally poignant human documents. Illustrative excerpts from these are added as:

Annexure G.—Statements made by women themselves in response to a public invitation to state their reasons for limiting their families, compiled by Dr. J. H. L. Cumpston.

From the study of all this material, and subject to the full text of each report, the Council submits the following conclusions and recommendations to Commonwealth and State Ministers and to the people of Australia upon this

problem, which it may describe without hesitation as the greatest and gravest issue it has ever had under consideration.

MAJOR ASPECTS OF THE PROBLEM.

The problem of the decline of the birth rate has been obvious since 1890 and a matter of attention in Australia since, at any rate, 1904, when a royal commission sat in New South Wales to consider and report on this matter.

This report ascribed the decline to the deliberate control of reproduction by women "led astray by false and pernicious doctrine into the belief that personal interest and ambitions, a high standard of ease, comfort and luxury are the essential aims of life".

The evidence which has accumulated indicates that this is far from being the whole story. There is no doubt that the two important factors responsible for the great growth of deliberate birth control were (i) the decreasing dependence of women and (ii) the increasing sense of insecurity—economic and psychological, social and international.

The Council recognizes, however, that limitation of families is often influenced by the desire of the parents to ensure appropriate educational and other justifiable advantages to the children already born to them. This must be considered a not unworthy excuse for the limitation of families in view of, and during, the prevailing sense of insecurity.

The decreasing dependence of women is well brought out in Annexure A, where Mrs. McPherson shows the changes in social structure that occurred from the late eighteenth to the early twentieth century and their significance.

The effect of the increasing economic insecurity is evidenced by the figures for birth rate and net reproduction rate seen in relation to wars and economic depressions, and, conversely, to periods of prosperity and economic promise.

The nineteenth century of peace had given people a sense of security, which was abruptly terminated by the South African war; the growing uncertainty and sense of insecurity were accelerated during the first world war; the reaction of the ten years succeeding the peace of 1918 reflected the general feeling that security was again ensured; but the depression years, followed by the events of 1938 and 1939, and finally the present world-wide war, have left the whole world with a feeling of insecurity which has affected all aspects of social life, and, particularly—as the letters from the women themselves show—have had a profound influence upon the decision of women to limit their families.

There was an increasing demand for contraceptive agents, and in response to it knowledge of these agents passed from an empirical to a scientific basis. Between 1925 and 1935 experimental work was done which established the relative reliability of the different types of contraceptives and made them readily available. Moreover, their use was steadily canvassed by business firms and by various groups advocating the "spacing of families".

Women, therefore, by education, by social emancipation, and by increased knowledge of methods of contraception, were enabled to make an effective decision as to whether they would limit their families, and as to the measure of that limitation, and many have done so.

In response to the Council's invitation many women have given their reasons for making such a decision, and these will be found analysed at some length in Annexure G.

It is to be noted that many of the women who wrote were not influenced by economic stress, being able, financially, to afford more children than they had.

Reference has been made above to limitation of families from a sense of insecurity under circumstances that were neither unworthy nor unduly selfish.

The number of letters in which women admitted abortions, deliberately induced, was, although the aggregate number was not large, very disturbing. It should be recognized that there are people, including a few medical practitioners, who are prepared to induce abortion. Society should punish adequately this violation of the existing law. At present it is recognized that the law is almost entirely inoperative.

While abortions were admitted by some and are undoubtedly undergone by many women, the number of women who lamented the fact that they could not have children was very considerable. It is evident that, if the causes of this sterility could be identified and removed, many women at present childless would be very happy to have children.

Some women ascribe childlessness to the special disabilities of rural life. As a matter of fact, as will be seen by the statistical record, the birth rate for the rural areas is greater and occasionally markedly greater than the city birth rates.

It is very clear, however, from the letters written by women in the country that they consider all the disabilities bear very much more heavily on women in the country than they do on city women. The items that they advanced principally were the following. There is no choice of goods; the variety offered by the country store or the mail order catalogue must be accepted. There are all the difficulties of housekeeping without any conveniences and only a tank water supply. There is the additional labour of cooking for and looking after farm or station employees. There is the uncertainty of income which is seasonal and dependent upon uncontrollable conditions. There is the difficulty of educating children and the necessity for sending the children away from home if they are to receive any education higher than primary standard. The mother has the responsibility for conducting correspondence education in places where no school is available. There is the anxiety, danger and difficulty which distance from a doctor or hospital entails, and the considerable addition to medical expense even if a doctor is available.

Greatest progress up to date in the exploration in the matter of the decline of the birth rate has been made by the statistical survey (Annexure B), and the shape of their final report may, perhaps, be foreshadowed by a series of quotations as follows:

There is no evidence that the long-term decline in the birth rate in Australia has yet run its course.

Neither disinclination to marry nor deferment of marriage has been a cause of the long-term decline in birth rate in Australia.

The proportion of married women who remain altogether childless appears to have increased substantially.

The culmination of the forty-year decline in the birth rate of Australia (from about 1890 to 1930) is that, by 1932, fertility fell to a level which, if continued, must inevitably eliminate all natural increase of the population.

Although there has been a further substantial wartime increase in births in 1944, nothing in the available statistics indicates any probability of a sustained rise in birth rate in the future.

Without immigration and with fertility continuing its recent trends, the growth of population in Australia will dwindle very rapidly after the year 1950. Within about twenty years from now, under the conditions stated, the population of Australia would reach eight millions, thereafter showing little further increase before actually beginning to decline. If the long-term decline in reproduction continues and there is no net immigration, the population of Australia would be back to its present level of about 7,300,000 within about sixty years from the present time.

While statistical analysis can reveal the degree and incidence of variations in birth rates, it cannot indicate conclusively their underlying causes. These must, in general, be discovered by other means. Statistics do, however, indicate facts of the present position and the probable future trend. These show conclusively the urgency that exists for the development of a population policy.

It is believed that the long-term decline in fertility reflects the adaptation of the family to the fundamental changes in social and economic organization which took place during the nineteenth century. These changes brought about a pattern of living which, as compared with earlier types of society, was essentially urban, competitive and individualistic.

Under these conditions, a number of social and economic factors can be identified which have increased the proportion of parents who plan the size of their family, and which at the same time reduced the number of children in planned families.

The idea of a "population policy" is likely to become discredited if any attempt is made to interfere with individuals' freedom to marry and plan their families as they wish. Propaganda in favour of larger families "in the national interest" seems unlikely to have much popular appeal. A democratic policy should aim rather at mitigating the economic and social disadvantages experienced by both the children and parents of larger families.

This type of policy requires that an appreciable part of the cost of bearing and rearing of children should be transferred from the individual parents to the community as a whole. In a democracy, however, there will be a limit to the extent of the subsidy (in cash or in kind) that can be granted by the less fertile taxpayers

to those with larger families. Within this limit the various measures should be carefully chosen to obtain the desired result.

Finally, it must be emphasized that the present is a far more favourable time to initiate a population policy than any that has existed since 1930. Contrary to experience in the previous war, births have risen substantially from 123,000 in 1939 to probably 160,000 in 1944. Though the causes are transitory, the fact remains that this adventitious rise has temporarily, at least, lifted reproduction in Australia above replacement level.

No population policy can automatically reverse the present decline; while it is considered an advantage to be childless depopulation will continue.

The instinct for parenthood, however warped by circumstances, can, to a considerable extent, be realized by freeing parents from many obvious disabilities, though, in the final analysis, repopulation can be attained only by correcting the present economic and psychological insecurity.

Though the ultimate determinant in the rise or fall of the population (excluding actual infertility) is the deliberate choice made by every present-day woman as to whether or not motherhood in her case is expedient, such individual decisions are governed by psychical and environmental factors, some of which at least may be advantageously controlled or modified by the Government and by the main mass of the people.

In Annexure E, Dame Enid Lyons and Lady Cilento have set out what they describe as the recompenses of motherhood both emotional and physical. They have emphasized with sympathy the ignorance of normal physiology that contributes to fear or over-anxiety on the part of young married women, particularly with the first baby. They deplore the tendency towards a loss of the personal factor and the over-regimentation in public maternity hospitals that may be called "mechanized maternity". They point out the incomplete provision of pre-natal care, adequate after-care, home help and other needs especially for young and inexperienced mothers. They have particularly emphasized the fact that normal childbirth and a normal number of pregnancies tend to improve the female physique and the harmonic and mental balance, in contradistinction to sterility, or to a long period of childlessness following the birth of one child, both of which may impose well-recognized physical disabilities. These include menstrual disabilities, uterine fibroids and chronic polycystic mastitis, besides emotional instability and nervous disorders. They conclude their report with a series of interesting recommendations.

In Annexure C, Miss Constance Duncan, as the result of an extensive survey in all States, has set out the existing provision for mothers and infants and some contemplated advances and has propounded a plan of action intended to correlate and include all that experience in the various parts of Australia and elsewhere has shown to be available. These recommendations are too detailed to repeat here, but they should be read carefully by all interested persons.

INTERIM CONCLUSIONS.

From all the sources of information available to date this Council finds initially four clear and clamant lines for reform. In its opinion these should be effected without delay. They are: (i) Provision of homes in which the occupier has some sense of ownership and responsibility. (ii) The provision of relief and help in many forms for the mother in the home. (iii) The provision of a greatly improved hospital, medical and nursing service for maternity. (iv) The provision, as far as possible, of economic security.

The Provision of Homes.

All housing schemes should provide "homes" rather than houses. Of all means of housing "flats" are the least desirable. This Council urges that the greatest industry of all—the home-keeping industry, which has hitherto been entirely neglected—should have its great importance fully recognized. This will mean that the same thought as to suitability of premises and efficiency of tools and equipment should be given to this, as is being given to other industries.

The provision of a home must, moreover, not be conditioned by the rent payable; the rent payable should be conditioned by other factors related to the economic status of the "family unit". The larger the family, the larger the house required, and, at present, the larger also the rental and the greater the cost of maintenance of the family in relation to the total of the breadwinner's weekly income. As a consequence overcrowding occurs with all its disadvantages to health, home life and home relationships, or alternatively, the amount spent on rent makes it necessary to sacrifice food

requirements (especially in protective foods) or social amenities that should and do make for the maintenance of family unity and family morale.

This Council has repeatedly expressed its views on this matter of housing and merely recalls to attention at this juncture, the fact that among the permanent essentials often overlooked or unduly restricted in the interest of immediate cost price, are: a sufficiency of floor space per head; adequate ventilation and play space for the children; adequate provision for a small kitchen garden; a design that is labour-saving, that is, built about the central power unit of the house and that "saves steps"; labour-saving devices that provide as great a saving of time to the housewife as similar devices do the workers in less important fields, and an environment made as stimulating as possible by: adequate lighting without undue glare; appropriately bright or restful colouring of walls and fittings; provision to aid cleanliness and to discourage dinginess and dirt lodgement; and a construction sufficiently solid to allow of the ready maintenance of house and fittings in good repair.

Moreover, the house must be adapted to a family of reasonable size, or so constructed as to permit of the ready addition of any other children's rooms as they are required. A definite factor in the limitation of families is the common limitation of room space, especially bedrooms, in the house, and, to an extreme degree, in flats.

Help to Mothers.

All girls should be taught domestic science and should learn how to handle an infant and how to care for a pre-school child. This training should commence at about thirteen years of age and might be continued in various forms into young womanhood. The Council repeats its previous recommendation that there should be a Department of Home Science in every university to train teachers for this purpose.

The problem of home help, especially in country districts where mothers have to do work from which the city mother is free, is a very difficult one. It is universally agreed that there should be an adequate service of home help for every mother. Even if that be not completely available it should certainly be possible to consider such a service for women for at least one month before and one month after confinement. This and the provision of rest homes are matters for serious consideration. Since in some cases the period of disability during pregnancy and after labour goes beyond one month, extended relief may be correspondingly necessary.

In the cities and towns there should also be provided such facilities for community use as communal laundries, kindergartens and day nurseries (nursery schools), playgrounds for children, better shopping facilities for mothers, mothers' clubs, holiday homes, rest homes, and similar measures.

All these have been widely advocated. There is no need for this Council to emphasize them again as desirable facilities. It is necessary, however, to point out that these have a more obvious and ready field of use in closely settled communities and offer no solution for the country mother whose disabilities require special consideration. The decentralization of industry, which may offset the present excessive drift to the cities, would materially alleviate country conditions.

The medical and hospital service suitable to women should be critically reviewed. There should be scientific study of sterility with the best possible advice available at suitable clinics for those who wish to have children but find themselves sterile.

As regards contraception, medical practitioners at times advise women not to have any more children for a given or indefinite period. This advice is given for adequate medical reasons; but the principles governing the use of contraceptive agents should be defined by the medical profession.

The teaching of obstetrics is a matter of great importance. It is well recognized and should be continually emphasized that medical practitioners must at the time of their graduation have sufficient knowledge of obstetrics and should be given hospital experience before entering practice. Frequent opportunities for attending "refresher" courses should be made available.

A considerable increase in maternity hospital accommodation in cities and towns and especially in country areas is essential. There should be more and better maternity wards so that every woman should find a bed available when she needs it. Obviously all such wards should be appropriately designed and fully equipped. The necessary expansion of existing facilities should be through public hospitals and approved private hospitals subsidized for the purpose. These aims would be defeated unless approval were made dependent

upon suitability of building, adequacy of staff and equipment and capable management.

There should be a high standard of supervision of childbirth by both doctors and nurses in order to prevent accidents during labour.

Research and study should be continued with the object of relieving the disabilities of pregnancy, the pains of labour and the after effects of both. The Council therefore proposes that the committee that it has set up to deal with the medical aspects of the decline in population should continue its work. It may be appropriate to quote here the following extract from "Report on a National Maternity Service" issued in May, 1944, by the Royal College of Obstetricians and Gynaecologists of England:

We believe that the sort of service we have in mind, and shall describe, would bring about the following improvements:

- (a) It would make available to any woman who wished to have it a complete service of the highest standard.
- (b) Fewer women would die in childbirth.
- (c) Impaired maternal health would become less common.
- (d) Fewer babies would be born dead and fewer would die during the first month of life.
- (e) The premature birth rate would be lowered and a higher proportion of premature babies would survive.
- (f) By better care of the mother during pregnancy, and of the infant in the early weeks of life, especially by the maintenance of lactation, a higher standard of infant health would be obtained and the infant mortality would fall.
- (g) By making arrangements for childbirth that were more accessible, less inconvenient and costly, and safer, it would do much to remove the social, economic and domestic deterrents from child-bearing, and the deterrent of fear.
- (h) The founding of families and the founding of them earlier in life would be encouraged.
- (i) Fuller coordination within the service of general practitioners and specialists, of health visitors and midwives, or pediatricians and obstetricians, of hospitals, clinics and domiciliary services, or local and central administration.
- (j) More satisfying conditions of work for doctors, midwives and others employed in the service.
- (k) Greatly improved facilities for teaching, not only of undergraduate students and pupil midwives, but also of post-graduate doctors and midwives; and above all, an adequate supply of young obstetric specialists in constant training.
- (l) More accurate records would be kept and research greatly encouraged.

These recommendations should be read in conjunction with the suggestions embodied in Annexure E and Annexure C.

ECONOMIC SECURITY.

The complexity of this subject is recognized; we feel able, however, to indicate certain aspects which seem to us worthy of attention.

The head of the house must provide for family life a home with the necessary equipment, food, clothing and facilities for education of his family. These are bare essentials, and beyond them he must if he can provide in some way against the misadventures of life, of which illness and accident, unemployment and the necessity to provide for his dependants in case of death are the most obvious. At present the allocation of the income of the working man is hardly within his own control. Considerations like those set out above could with advantage be studied in order that adjustment might be made where possible.

The Council points out that merely to replace the population without striving for increase requires 3.3 (say four) children per family. An income which provides for less is manifestly unequal to the needs of this great national problem. The Council suggests that this vital national question should, therefore, be reviewed upon the basis of "the family unit" in which no man without wife or children should be regarded as nationally equal in value to a man with a wife and children, and that conditions should be made such that a man and wife and four (or more) healthy children should receive adequate consideration.

The Council, therefore, suggests that the economic insecurity of the larger family is worthy of more critical examination. Increasing social benefits in the form of cash payments over the counter may not be the best solution. The same, or better, results might be obtained by:

Relieving the citizen of the fear of unemployment.

Relieving the citizen, in part at least, of the expense associated with illness or accident.

Providing homes on an "ownership" basis for family units comprising a man, wife and four children, at repayment rates adjusted to income levels in such a way that they will permit repayment from the basic wage applicable, without imposing any restriction upon the supply of food and the provision of certain social amenities necessary for the maintenance of healthy self-respect and family pride.

Food and clothing adequate in quantity and quality and reasonable in price being accessible to all members of the public.

Adjustment of taxation and of child endowment in terms of the family unit so that the number of children is more equitably compensated for than is the case at present.

The Council definitely feels that a solution such as that suggested above would be more acceptable to independent Australian citizens than a mere system of increasing cash payments made with the object of encouraging the birth rate.

The Council emphasizes that the present report is of an interim nature. No simple solution and no final statement is yet possible. The whole problem is very complex, and for that reason the Council sought the aid of several specially constituted committees, whose reports are published as annexures hereto. The Council appreciates very highly the work of these committees, and expresses its sincere gratitude to them. Although the Council does not necessarily concur in all the recommendations, their careful study and consideration will materially help towards a better understanding of a matter so gravely affecting our nation's welfare.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on October 12, 1944, at the Robert H. Todd Assembly Hall, British Medical Association House, 135, Macquarie Street, Sydney, Dr. G. C. WILCOCKS, the President, in the chair.

Sterility.

DR. F. A. BELLINGHAM read a paper entitled "Sterility" (see page 129).

DR. A. M. DAVIDSON said that he was grateful to Dr. Bellingham for his excellent paper. Dr. Davidson was particularly pleased to have heard it, because it had arisen out of a suggestion of the committee set up by the National Health and Medical Research Council to investigate the falling birth rate and infant wastage. Sterility was only one of the subjects to be investigated by the committee; others included contraception, the need for domestic help *et cetera*. The question of sterility was brought forward as being of primary importance, and because, as Dr. Bellingham had pointed out, so much blame in the past had been attributed to the female partner for being "barren", whereas in many cases the male partner was responsible. When the figures relating to sterility were investigated, it was a most extraordinary fact that only rarely did one medical man examine both partners; in other words, the gynaecologist investigated the females and the urologist investigated the males. There was a great lack of standardization; even now no agreement had been reached as to the standard of fertility of spermatozoa in the specimens. The main purpose of the evening's meeting was to stimulate many practitioners throughout the Commonwealth to interest themselves in the important subject of sterility, and to try to set up standards and methods that could be generally applied. All should agree with Dr. Bellingham that the methods he had set forth could be universally applied. Dr. Davidson then referred to the question of malaria and sterility. He said that unfortunately a certain amount of publicity had recently

been given to that problem. Three families amongst persons known to Dr. Davidson had lived for some thirty years prior to the war in New Guinea and malarious areas, and there was no question of sterility in regard to them; all the families had the normal number of children, who had grown up. The people concerned took quinine regularly. Dr. Davidson said that he had had much pleasure in talking along those lines to soldiers. Moreover, in the days of which he was talking, dwellers in New Guinea had no vitamins; they had nothing to eat that did not come out of a specially sealed tin. The only vitamins they may have had were obtained from yams and other vegetables which they grew themselves. They never had butter; however, their fertility was maintained. In conclusion, Dr. Davidson said that he was sure the committee would feel, when the paper was published, that it had achieved a good object and had taken a step forward on the way of finding some real statistics on this important subject.

DR. J. N. CHESTERMAN added his congratulations to those of Dr. Davidson. Dr. Chesterman said that he regretted that Dr. Bellingham had not defined sterility. He asked whether a patient was sterile because she had not had a baby for two or three years. What was the standard? Dr. Chesterman thought this question important at the present time; patients consulted him who had been married for two or three years, but it was found on detailed inquiry that they had been separated from their husbands for long periods. It was necessary to know when to begin carrying out investigations, and when to advise the patients to wait a little longer. Dr. Chesterman then asked what was Dr. Bellingham's opinion about the use of contraceptives in relation to subsequent sterility. It was common for newly married couples to decide not to have a baby for twelve months or more; Dr. Chesterman wondered whether such a period of contraceptive practice influenced subsequent fertility. Dr. Chesterman also asked what was the physiology of menstruation when it was anovulatory in type. If the endometrium never reached the secretory stage, would menstruation be considered normal, or would it be the type that occurred in the non-secretory phase?

DR. C. L. CHAPMAN said that Dr. Bellingham's paper reflected great credit on his own zeal and enthusiasm, and also on the facilities at the Women's Hospital, Crown Street. The first point to which Dr. Chapman referred was endocrine therapy, of which a great deal of mention was being made; of all disappointing methods in the treatment of sterility, Dr. Chapman thought it about the worst. The effect of oestrin was variable and unsatisfactory; sometimes it caused grave disability; irregular menstruation might result, and sometimes sterility had been turned into menorrhagia. In one or two cases which had come to his notice, hysterectomy had had to be performed. Kaufman was often thought to have stated that if female patients with primary amenorrhoea were given oestrin, menstruation could be produced. What Kaufman had actually stated was that haemorrhage could be produced, and that was vastly different. Dr. Chapman then spoke of the use of lipiodol. He said that in his opinion it should be used only by experts. The average practitioner should confine himself to the use of Rubin's inflation test. If necessary, the patient could then be submitted to an expert for investigation by means of the instillation of lipiodol. The procedure was dangerous. If the results following all investigations of sterility were poor, it was not desirable to make any more people sterile by using some method that would induce some form of inflammation likely to cause sterility. Dr. Chapman said that he could support his contention by many examples.

Dr. Bellingham had referred to the unsatisfactory results of operations. Dr. Chapman said that the uterus itself was often diseased when the Fallopian tubes were diseased. If the patient did become pregnant after operation, she was very likely to miscarry early owing to the diseased condition of the uterus. Another thing causing disappointment was that the cornual ends of the Fallopian tubes were often obstructed, and that condition rendered operation difficult. However, such operations were worth performing when the inflammatory storm had settled down and there was no danger of starting it again. Retroversion was a common cause of delayed conception. Dr. Chapman considered that the operation for external shortening of the round ligaments in uncomplicated cases should be in the armamentarium of all practitioners; it should be performed early, preferably before marriage, so that much dyspareunia and dysmenorrhoea might be prevented.

DR. R. B. C. STEVENSON thanked Dr. Bellingham for his entertaining and stimulating paper. Dr. Stevenson felt that he should rise in support of Dr. Bellingham, prompted by one

remark of Dr. Chapman's on the question of surgical treatment in female sterility. Dr. Chapman had said that the awareness of the fact that tubal disease was often accompanied by uterine disease had been overlooked. In Dr. Bellingham's cases a biopsy specimen from the uterus was examined first of all, to show whether uterine disease was present. In conclusion, Dr. Stevenson asked Dr. Bellingham to explain three terms—azoospermia, aspermia and oospermia; he realized that the question was really one for a pathologist or urologist.

DR. GRACE CUTHBERT also congratulated Dr. Bellingham on his paper. She said that from the technical point of view she had been impressed with its thoroughness. Dr. Bellingham's work would give many general practitioners, who had not the time or the opportunity to carry out many investigations, the assurance that they would be thoroughly carried out for patients who could not afford private fees at one of the hospitals in Sydney if the patient was sent there. The New South Wales Department of Public Health, as a result of posters and notices in tram cars *et cetera*, was often approached by people who wished to have their health problems investigated. Dr. Cuthbert's experience was mostly with patients who could not afford private fees for investigation, or who had already paid out a considerable amount of money. Dr. Cuthbert was interested in the clinic at the Women's Hospital, Crown Street; she had found invariably that patients referred to it by the health department had their problems thoroughly investigated. All medical practitioners who had had cases of sterility in their private practices realized that the condition was of grave concern to the partners, and if the patients could be satisfied that their state would be thoroughly looked into, that fact was a help to their happiness and well-being. Patients referred to the clinic by the health department all had sterility of some duration. Dr. Bellingham's figure of 40% for patients becoming pregnant after investigation was commendable. The sterility clinic had been of great value in Sydney.

DR. F. N. CHENHALL also congratulated Dr. Bellingham on his paper. He said that the subject of sterility was far too big to be completely dealt with in one evening. Dr. Chenhall said that he agreed with Dr. Bellingham's remarks on the "relative factor" theory of sterility as applied to the seminal fluid. Seldom, if ever, were there any absolute factors. The question of motility of the spermatozoa was a worry to him; he wondered whether Dr. Bellingham attached any importance to it. What figures did Dr. Bellingham accept? Some people held that motility did not matter. Dr. Chenhall had known women to become pregnant with seminal fluid containing as small a number as 12,000,000 motile spermatozoa in three cubic centimetres, or 4,000,000 per cubic centimetre. Dr. Chenhall then referred to Dr. Stevenson's comment on Dr. Chesterman's remarks about the endometrium. Dr. Chenhall said that he encountered many cases of hyperplasia associated with the luteal phase of the endometrium, and he wondered whether Dr. Bellingham found the same thing. Referring to Dr. Chesterman's comments on the taking of the original history, Dr. Chenhall said that this was important. In the case of women whose husbands had been away for a long time, or who had been using contraceptives for long periods, the period of absolute infertility was often very short. A psychological factor was involved as well; often such women became pregnant a short time after they came for investigation. Dr. Chenhall asked for some comment on that aspect of the question. He agreed with Dr. Chapman that, if an abnormal condition of the general pelvic organs existed, even if the patient became pregnant, she frequently miscarried early. With regard to retroversion, Dr. Chenhall said that perhaps Dr. Bellingham did not think it was of much importance as a cause of sterility. Dr. Chenhall's opinion was that retroversion with prolapsed ovaries should be regarded as a much more acutely abnormal condition than it was at present, and young wives who had such conditions and suffered from dyspareunia should be admitted to hospital and operated on much earlier than was the case. The trauma to the ovaries should be ended as soon as possible. That was the real answer to the problem of sterility and retroversion. If the condition was left too long untreated, the ovaries were finished; at that stage no pain was present, and the condition was not so obvious.

DR. A. L. WATSON also thanked Dr. Bellingham for his paper, which dealt with a matter of national interest. One point brought up by Dr. Chesterman bore repetition and had not been mentioned by Dr. Bellingham—the question whether contraception was a cause of sterility. Dr. Watson said that some time previously, as a matter of interest, he had gone through 500 or 600 cases of sterility extending over seventeen

or eighteen years in his private practice. Many of the people who complained of sterility had been using contraceptive methods. Dr. Watson concluded from his investigation that 90% of couples who had been using contraceptives for five years or more and then decided that they would have a baby, found they could not do so. The use of contraceptives for twelve or eighteen months seemed to have no effect in producing sterility. Dr. Watson asked whether Dr. Bellingham had investigated at his clinic the subject of contraception as a potential cause of sterility.

Dr. Bellingham, in reply to Dr. Davidson, said that he agreed that malaria was a bogey. He himself had spent twelve months in New Guinea, where the residents all took quinine daily; people there had no markedly smaller families than anywhere else. Dr. Chesterman had asked him to define sterility; Dr. Bellingham said that he had actually done so in his paper, but had omitted to deliver that section. In his own series of cases, none was regarded as a case of sterility unless both partners had been together and had been trying to have a baby for over twelve months. The average period of sterility was five or six years, the longest eighteen years. There was no iron-clad rule for the length of time after which sterility was said to be present. Dr. Bellingham said that a period of sterility followed the use of contraceptives, especially chemical contraceptives. The period might be long or short; but the pH of the vagina was probably somewhat changed by the use of chemical contraceptives. Referring to Dr. Chesterman's remarks about anovulatory menstruation, Dr. Bellingham said that Dr. Chapman had almost answered him. In cases in which endocrines were employed and hemorrhages occurred—so-called "periods"—Dr. Bellingham said that he regarded the bleeding as oöstrin bleeding, and certainly not a menstrual discharge with ovulation. Such bleeding could occur in women who had had both ovaries removed. Endocrine substances might be dangerous if misused. Dr. Bellingham recalled the case of a nurse, who at the age of about twenty-two years had had both ovaries removed. After about five years she consulted him for menopausal flushing. Dr. Bellingham gave her stilbestrol in a dosage of 1.0 milligramme twice a day. He did not see her again for some time. In the meantime she had had other advice from a non-medical person, who had increased the dose to five milligrammes three times a day. She ultimately had a carcinoma of the body of the uterus, and it was not impossible that the stilbestrol acted as a carcinogenic agent. Referring to anovulatory menstruation, Dr. Bellingham said that it usually occurred with irregular menstrual periods and short cycles, but it might occur with normal menstrual cycles. It might be the adrenal or pituitary type of dysfunction. Normal women, too, had periods of anovulatory menstruation; these periods were more likely to occur at the beginning and end of menstrual life. Referring to vitamin E, Dr. Bellingham said that he did not give it except to prevent miscarriage. It was of value in cases of habitual abortion, but of no value whatever as a cure for sterility. However, whether he used "Antultrin S" or vitamin E for threatened abortion, he still put the patient to bed. A large amount of success might be due to the rest the patient was given. Dr. Bellingham agreed with Dr. Chapman that a practitioner who did not carry out many inflation examinations should use Rubin's test; but he did not think that the risks of lipiodol instillation were very great, provided that before the X-ray examination was attempted it was ascertained that no infective changes had taken place in the vagina, uterus or Fallopian tubes, and provided that only a small quantity of lipiodol was used. An excess might carry in unsuspected infection and was absorbed only gradually. The great value of lipiodol was in contemplated salpingostomy, because air did not reveal at which end of the tube the blockage was situated. In reply to Dr. Stevenson, Dr. Bellingham said that azoospermia meant the presence of seminal fluid, but the absence of spermatozoa; aspermia meant the absence of almost all the constituents of seminal fluid, so that the fluid consisted mainly of prostatic secretion; oospermia he could not define. Commenting on Dr. Grace Cuthbert's remarks, Dr. Bellingham said that a full investigation and the telling of the truth to these people were very important; "hope deferred maketh the heart sick", and if it was certain that a couple could never have a child, they should be told so. Such a prognosis carried a certain amount of psychic trauma; but Dr. Bellingham made it his practice never to tell the subjects that they could not produce a child without offering to help them to adopt a baby. A large number of babies had been adopted, with happy results. In reply to Dr. Chenhall, who has asked about the motility of spermatozoa, Dr. Bellingham said that about 50% was the average. He did not regard motility as essential, but thought it

necessary to evaluate the specimen as a whole, from the point of view of its subfertility or otherwise. The most important constituent was the presence of abnormal forms; the greater the number of abnormal head forms, the worse the prognosis. The other factors were only contributory, possibly motility had something to do with long-delayed pregnancy; the spermatozoa would have to be deposited close to or into the *os uteri*, or else artificial insemination might be necessary. Dr. Bellingham agreed that many patients became pregnant with seminal fluid having a surprisingly low spermatozoa content. On all his record cards of patients who became pregnant, "V for Victory" was printed in one corner. He proposed to find out in how many of his cases pregnancy occurred in spite of a low sperm content in the seminal fluid. The minimum was 60,000 per cubic centimetre. Referring to retroversion, Dr. Bellingham said that he agreed that it had a bad effect on the ovaries; the main type of retroversion that required operation was that in which the uterus was fixed back with adhesions. But Dr. Bellingham did not agree that an ovary was "finished" immediately it became cystic; he thought that quite often even a small piece of ovary was useful, and it was his practice to leave it and not remove it.

Dr. Wilcocks, from the chair, thanked Dr. Bellingham and those who had contributed to the discussion for an interesting meeting. Dr. Wilcocks was sure that interest would be stimulated in the subject, which, so far as the male aspect was concerned, was developing. The female side of the question had long been fairly well studied; but the male side had not. Dr. Wilcocks congratulated Dr. Bellingham on his courage in making definite statements.

NOTICE.

THE General Secretary of the Federal Council of the British Medical Association in Australia has announced that the following medical practitioner has been released from full-time duty with His Majesty's Forces and has resumed civil practice as from the date mentioned:

Dr. G. Raleigh Weigall, 62, Wellington Street, St. Kilda, Victoria (September 29, 1944).

Medical Societies.

MELBOURNE PEDIATRIC SOCIETY.

A MEETING of the Melbourne Pediatric Society was held on July 12, 1944, at the Children's Hospital, Carlton. Dr. H. DOUGLAS STEPHENS, the Acting President, in the chair.

Suppurative Arthritis of the Hip Joint.

DR. J. G. WHITAKER said that three months ago he was faced with the problem of dealing with three infants, each of whom suffered from suppurative arthritis of the hip joint. Two of the patients were present; the third could not without great difficulty be brought to the hospital, and Dr. Whitaker proposed to give a brief *résumé* of the case history and clinical findings.

The first patient was a male child, aged twelve weeks, who had been admitted to the Children's Hospital at the age of three weeks, weighing six pounds one and a half ounces. He had been breast fed and weighed six pounds fourteen ounces at birth. For four days prior to his admission to hospital he had been taking his feedings badly. The stools had been frequent in number and green in colour, and had contained curds. On examination, the only abnormality discovered was a small white lump on one of the faucial pillars. The baby was thin and had to be fed by gavage. He was treated as a "dietetic problem" for a fortnight, when a large round swelling was noticed in the upper part of the right thigh. This was aspirated, and culture of the pus obtained yielded a growth of *Bacillus proteus*. X-ray examination of the right hip joint revealed a pathological dislocation due to acute arthritis with involvement of the acetabulum, femoral head and femoral neck. The general condition of the baby was not good; he was vomiting and the bowels were opening frequently, and he was gaining in weight very slowly. There had been no significant variation in his temperature. The swelling of the upper part of the right thigh appeared to be indurated. At this stage a double hip

spica was applied. Two weeks later twelve cubic centimetres of thick pus were aspirated from the right thigh. A week after this, after a blood transfusion, an incision was made into the thigh, "Novocain" being used for local anaesthesia and "Sodium Amytal" (130 milligrammes given intramuscularly) as a basal hypnotic. The incision measured one and a quarter inches in length and was made over the lateral part of the right thigh at the level of the greater trochanter. Five or six ounces of creamy pus were liberated. A piece of cartilage resembling the head of the femur accompanied the pus. The abscess cavity tracked in three directions—firstly, to the postero-medial aspect of the joint and posterior to the sacro-iliac joint, secondly, posterior and medial to the lesser trochanter and into the soft tissues on the medial aspect of the thigh, and thirdly, laterally along the shaft of the femur. Rubber tubes were inserted along these tracks. "Yellow dust" ("Monacrin" powder) was at first blown along the tubes; but as the application was difficult, a 25% watery solution of "Monacrin" was injected every four hours. Penicillin was not employed. After the operation, the patient's general and local condition improved and he became apyrexial. His leg was immobilized in simple extension. The latest X-ray film of the hip joint showed that the lesion was quiescent; but disorganization of the hip joint had occurred with upward dislocation of the femur.

Dr. Whitaker's second patient had been admitted to the Children's Hospital at the age of five weeks. Delivery had been normal. The baby was breast fed for the first two weeks, but had lost weight, and had been changed to condensed milk feedings. At the age of three weeks, erysipelas developed over the right thigh and the vulva; this subsided with sulphanilamide therapy. At four weeks a fluctuant swelling appeared in the inguinal region. Three days before the baby's admission to hospital this was incised, and pus drained from the wound. X-ray examination revealed a pathological dislocation of the right hip, apparently secondary to the acute arthritis. A plaster spica was applied. Sixteen days after the child's admission to hospital a transfusion of six ounces of blood was administered. X-ray examination at this time showed that the dislocation was persisting, and osteoperiosteal changes were more prominent. A new spica was applied thirty-five days after admission to hospital. A further X-ray examination two months after admission to hospital showed that the right hip was still dislocated, but the bony inflammation had completely subsided. The spica was removed and a double abduction splint was fitted. Dr. Whitaker said that in this case he thought the onset must have been in intrauterine life or at a very early stage of extrauterine existence. It was noteworthy, too, that the baby could not move his foot because of inflammatory pressure on the sciatic nerve.

Dr. Whitaker's third patient had first been examined by him at the age of three weeks. The baby then had a brawny swelling over the left thigh from hip to knee. Birth had been normal, and there had been no evidence of infection in the mother or baby. During the second week of life sclerematous deposits had been observed in the upper part of the left thigh and the buttock and in the outer side of the left calf. The brawny swelling of the upper part of the left thigh was, at the time of the first examination, accompanied by oedema of the surrounding parts involving the penis and scrotal sacs, and extending up the anterior abdominal wall. The left foot was also oedematous at this time. There was no spontaneous movement in the whole of the left lower limb; it was quite limp and fell readily into a dependent position. X-ray examination revealed osteomyelitis involving the left ischium just above the hip joint. Treatment consisted of the administration of sulphanilamide, which was begun as soon as the inflammatory condition became manifest, and immobilization of the limb in an abduction splint. No operative procedures were thought necessary. The improvement obtained had been satisfactory.

DR. J. W. GRUVE stressed the association of septic conditions in the child, especially that of umbilical sepsis. He thought that penicillin might improve the result, but the orthopaedic problem still remained.

DR. B. R. HALLOWS said that he had a case in the outpatient department, in which the possible focus of infection was acute mastitis in the mother. He also had another case in which the trouble had commenced at the age of six months with acute osteomyelitis of the upper end of the femur, and although the lesion was quiescent, great difficulty was experienced in reducing the pathological dislocation.

DR. ROBERT SOUTHEY instanced two cases of obstinate skin infections associated with arthritis, each of which had a fatal termination. One of the babies had been handled by a wardmaid, who was suffering from paronychia.

DR. KATE CAMPBELL pointed out that skin sepsis and over-crowding were important factors associated with suppurative arthritis, and instanced the distribution of staphylococci from the noses of attendants; but her experience showed that other forms of sepsis such as meningitis, pleurisy and pericarditis were equally prevalent.

DR. H. DOUGLAS STEPHENS considered that breast sepsis in the mother and umbilical sepsis in the infant were most important factors. He found that a common history was that there was a swelling in the region of the hip joint. This swelling was poulticed, and later the abscess ruptured. The head of the bone was destroyed, especially in staphylococcal infections. He found that streptococcal infections were not so disorganizing. The great problem was whether the joint should be fixed, and how this fixation should be attained.

Dr. Whitaker, in reply, said that his reason for showing the patients was to stress the great importance of wide abduction and extension. He also said that penicillin would be of help in the early control of the infection.

Thymus Enlargement.

DR. J. W. GRIEVE showed a male child, aged five months. Delivery had been normal and the birth weight was nine pounds four ounces. The baby was breast fed. At two months the mother noticed that the infant had a croaking type of wheeze in the throat during respiration, but his breathing was not distressed. The wheeze was audible at night. It had not become progressively worse. Vomiting was not an uncommon occurrence, and this no doubt contributed to the meagre gain in weight each week. However, at the time of the meeting the child weighed fifteen pounds twelve ounces. No respiratory infection had occurred. There was no family history of asthma or tuberculosis. On examination, the baby appeared to be healthy, but an inspiratory stridor could be detected in his breathing. No glandular enlargement could be felt, and the trachea was not displaced. On percussion, two fingers' breadth of retro-sternal dullness was detected. An inspiratory wheeze could be heard all over the chest. X-ray examination revealed an enlargement of the thymus mostly on the right side. The Mantoux test failed to produce a reaction. Treatment had been commenced and consisted of deep X-ray therapy at intervals of one week for three weeks.

DR. K. HALLAM doubted that the shadow as seen in the X-ray film was that of the thymus, because the appearance did not agree with his version of thymic shadows seen radiographically. He also pointed out the tortuous course of the trachea when it was projected forward by a pre-vertebral mass; but he was unable to offer any suggestions as to the nature of the abnormality. His criticism was destructive; but he thought that a thoracic endothelioma might be a possibility.

DR. KATE CAMPBELL thought that the condition might be a *spina bifida anterior*.

DR. H. DOUGLAS STEPHENS thought that the condition might be a hemorrhagic condition persisting from birth.

Dr. Grieve, in reply, said that he considered that the swelling was the thymus because of the site of the shadow and the clinical history. The radiologist had reported that the shadow was that of the thymus. Percussion revealed dullness in that region, and that was in agreement with the X-ray findings. The treatment to be used was deep X-ray therapy for three weeks. Dr. Grieve said that some patients had made spontaneous recoveries. In the present case the attacks had not been paroxysmal, and consequently, he preferred to call the condition thymic stridor and not thymic asthma.

Ovarian Dermoid Cyst.

DR. HENRY SINN, in the absence of DR. WILFRED FORSTER and DR. REGINALD WEBSTER, who were respectively to present the clinical features and pathological findings, described a case of ovarian dermoid cyst. Dr. Sinn thought it would be regrettable if such an unusual specimen should pass unnoticed. It came from a girl, aged five years, whose mother had become concerned about her daughter's abdominal distension over the preceding three months. In spite of the absence of any other symptoms. Examination of the abdomen had enabled Dr. Forster to outline a round, mobile swelling arising out of the pelvis. This was dull to percussion and was about the size of a large orange. All investigations, including X-ray examination of the chest and abdomen, microscopic examination of the urine and the performance of a Mantoux test, a Casoni test and a hydatid complement fixation test, gave negative results. Operation

was performed by Dr. Forster, a right paramedian incision being used. A large cystic swelling presented. This proved somewhat difficult to extract through the incision, owing to its size. It was dissected off the adherent left Fallopian tube and removed. No other abnormality could be discovered and the child made an uninterrupted recovery.

The specimen was submitted to Dr. Reginald Webster for pathological study. He reported that the cyst was an example of a cystic ovarian teratoma or so-called "dermoid" cyst. Much smegmaceous material was evacuated and a long rope of hair was conspicuous in the specimen. Two bony spicules were present near the hair-bearing area; these were possibly teeth, but the point had not yet been determined, as the sections had been delayed by the necessity for decalcification.

The cyst was lined by stratified squamous epithelium, and the skin appendages, hair follicles and sebaceous glands figured prominently in the section. It was owing to the predominance of skin structures that such cysts had become known as ovarian "dermoids". That they were really teratomata was evident from the fact that there was usually to be found at one pole a thickened or protuberant portion in which bone, cartilage, non-striped muscle, various glandular structures and even nervous tissue were recognizable on microscopic examination. The benign cystic teratoma, of which the present cyst was an example, had provided the hospital museum with several specimens of its type; it was fortunately much more common than the solid teratoma, in which malignancy was much to be feared. The single example of malignant teratoma of childhood which the museum had acquired, was a large tumour, in the main solid, but exhibiting various relatively small cystic spaces. There was no reason to regard the specimen under discussion as other than a benign cystic teratoma or "ovarian dermoid".

DR. J. BEGG commented that he had seen the patient in the out-patient department and had been impressed by the great mobility of the mass. Because of this fact he considered that the lesion was possibly a mesenteric cyst.

DR. BRUCE R. HALLOWS asked whether the cyst was centrally placed in the lower part of the abdomen.

Dr. Sinn said that it was, and that this was a point in favour of a diagnosis of a simple cystic condition of the ovary.

(To be continued.)

Correspondence.

OVARIAN TUMOUR.

SIR: I was very interested in an article by Dr. H. F. Bettinger, Dr. D. F. Lawson and Dr. R. Warren in THE MEDICAL JOURNAL OF AUSTRALIA of January 6, 1945, on "Theca-Cell Tumours of the Ovary".

My interest in the article has prompted me to report the following case: Mrs. L.B., aged seventy-two years, came under my care first in 1937 when I did a radical removal of her breast for carcinoma. At this time she had several slight vaginal hæmorrhages. She had what appeared to be a uterine fibroid about three inches in diameter. Two years after the breast operation she developed precordial pain on exertion, nocturnal dyspnoea, and had three attacks of pulmonary oedema during the next three years. The "fibroid" was increasing in size, but the vaginal hæmorrhages were getting less. Owing to her very poor cardiac condition one decided against removal of the pelvic tumour at that time, and she was unwilling to go away for radiotherapy. This state of affairs continued till July, 1942, when the bleedings became more frequent and were almost continuous till operation on January 25, 1943. A radiologist was consulted and he advised against radiotherapy because of the size of the tumour, which now reached to the umbilicus.

At operation the supposed fibroid was found to be a very large fibro-cystic neoplasm in the right ovary. The uterus was enlarged and congested in appearance. The tumour was removed and a complete hysterectomy was done. The operation was done under spinal anaesthesia.

The tumour was sent to Dr. R. A. Willis, of the Alfred Hospital, who reported: "Ovarian tumour is a granulosa cell tumour with predominant spindle-celled, or so-called 'thecoma' structure, but with follicle-like spaces with an epithelial lining. The uterus shows enlargement of both

muscle and endometrium; the latter showing pronounced cystic hyperplasia. If removed intact the ovarian tumour is unlikely to recur."

She completely recovered and has been very well since. Her cardiac condition has improved very greatly.

This was not the rare theca-cell tumour as reported by Dr. Bettinger, Dr. Lawson and Dr. Warren, but the less rare granulosa cell tumour. It was of interest because of its unusually large size, and the very marked endometrial hyperplasia caused by the excess of oestrin produced by the tumour.

Yours, etc.,

Ararat,
Victoria.

FRANK CH. DE CRESPIGNY.

January 13, 1945.

Research.

THE ELLA SACHS PLOTZ FOUNDATION.

THE twenty-first annual report of the Ella Sachs Plotz Foundation for the Advancement of Scientific Investigation has been received. In the twenty-one years of its existence the foundation has made five hundred and eight grants which have been distributed to scientists throughout the world. During its twenty-first year 27 applications for grants were received; 19 came from the United States and the remaining eight from five different countries in Europe, Asia and South America. The 18 grants made are set out in a list. The grants outside the United States were made to workers in England, Canada, Brazil, the U.S.S.R. and Palestine. The following is a statement by the Trustees regarding the purposes of the fund:

1. For the present, researches will be favoured that are directed towards the solution of problems in medicine and surgery or in branches of science bearing on medicine and surgery.

2. As a rule, preference will be given to researches on a single problem or on closely allied problems; it is hoped that investigators in this and in other countries may be assisted so that more rapid progress may be made possible.

3. Grants may be used for the purchase of apparatus and supplies that are needed for special investigations, and for the payment of unusual expenses incident to such investigations, including technical assistance, but not for providing apparatus or materials which are ordinarily a part of laboratory equipment. Stipends for the support of investigators will be granted only under exceptional circumstances.

According to the report the policy outlined in paragraph 2 has been neglected and grants will be made in respect of sciences closely related to medicine without reference to special fields. The maximum size of grants is usually less than \$500. Applications for grants during the year 1945-1946 must be in the hands of the executive committee before April, 1945. No special forms are required, but letters asking for aid must state the qualifications of the investigator, an accurate description of the research, the size of the grant requested and the specific use of the money to be expended. Applicants for aid should state whether they have approached other foundations for financial assistance; and letters of recommendation from the directors of the departments in which the work is to be done should be included. Applications should be sent to Dr. Joseph C. Aub, Massachusetts General Hospital, Fruit Street, Boston 14, Massachusetts, U.S.A.

Australian Medical Board Proceedings.

NEW SOUTH WALES.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Practitioners Act, 1938-1939*, of New South Wales, as duly qualified medical practitioners:

Lantos, Stephen Stacey, M.B., B.S., 1944 (Univ. Sydney), WallSEND District Hospital, WallSEND.

Lowe, Betty Marjorie, M.B., B.S., 1944 (Univ. Sydney), Eastern Suburbs Hospital, Waverley.

Milson, Anthony Howard, M.B., B.S., 1944 (Univ. Sydney), Sydney Hospital, Sydney.

Oliver, Norma Mary, M.B., B.S., 1944 (Univ. Sydney), Wagga Wagga Base Hospital, Wagga Wagga.

O'Neill, Vennard Francis Joseph, M.B., B.S., 1944 (Univ. Sydney), Mater Misericordiae Hospital, North Sydney.

Scanlan, Frederick Joseph, M.B., B.S., 1944 (Univ. Sydney), Royal North Shore Hospital, St. Leonards.

Scott, Godfrey Chesworth, M.B., B.S., 1944 (Univ. Sydney), Lithgow District Hospital, Lithgow.

Slattery, Edward Matthew, M.B., B.S., 1944 (Univ. Sydney), Lismore Base Hospital, Lismore.

Smythe, William Edward, M.B., B.S., 1944 (Univ. Sydney), Grafton Base Hospital, Grafton.

Stanger, Donald James, M.B., B.S., 1944 (Univ. Sydney), Ryde District Soldiers' Memorial Hospital, Ryde.

Stapleton, Joseph Edward, M.B., B.S., 1944 (Univ. Sydney), Dubbo Base Hospital, Dubbo.

Taverney, James Maurice, M.B., B.S., 1944 (Univ. Sydney), Albury District Hospital, Albury.

Vanderfield, Geoffrey Keith, M.B., B.S., 1944 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

Walsh, Clement Henry, M.B., B.S., 1944 (Univ. Sydney), Saint Vincent's Hospital, Darlinghurst.

Kuner, Lea, M.B., B.S., 1943 (Univ. Queensland), 1256, Pacific Highway, Pymble.

Sweetman, Keith Franklin Drysdale, M.B., B.S., 1937 (Univ. Melbourne), No. 3 R.A.A.F. Hospital, Concord West.

Thomas, Evelyn Livingston, M.B., B.S., 1943 (Univ. Melbourne), Jerilderie.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Badham, Charles David, M.B., B.S., 1944 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

Billings, Alison Margaret, M.B., B.S., 1944 (Univ. Sydney), Bathurst District Hospital, Bathurst.

Egan, Maxwell Christmas, M.B., B.S., 1944 (Univ. Sydney), 155, Greenwich Road, Greenwich.

Henchman, David Crossborough, M.B., B.S., 1943 (Univ. Sydney), NX203588, Captain David Henchman, 128 Australian General Hospital, Australia.

THE undermentioned have been elected as members of the South Australian Branch of the British Medical Association:

Anderson, Max Kimberley, M.B., B.S., 1943 (Univ. Adelaide), Lochwinnoch Road, Torrens Park.

Archibald, Francis Callum, M.B., B.S., 1944 (Univ. Adelaide), "Swinton", Blackwood.

Anderson, Jack Sidney, M.B., B.S., 1944 (Univ. Adelaide), Lochwinnoch Road, Torrens Park.

Andrew, Hugh Graham, M.B., B.S., 1941 (Univ. Adelaide), 134, Burnside Road, Burnside.

Gordon, John Vivian, M.B., B.S., 1942 (Univ. Adelaide), 227, Young Street, North Unley.

Lewis, John Aylward, M.B., B.S., 1944 (Univ. Adelaide), 22, Fitzroy Terrace, Fitzroy, South Australia.

Lampard, Dudley John, M.B., B.S., 1941 (Univ. Adelaide), 20, Northgate Street, Unley Park.

Norman, William Gowan, M.B., B.S., 1938 (Univ. Adelaide), 37, Fullarton Road, Mitcham.

Richards, Norman Alfred, M.B., B.S., 1942 (Univ. Adelaide), 177, Magill Road, Maylands.

White, Alan Hubert, M.B., B.S., 1921 (Univ. Adelaide), 230, Napier Terrace, Unley Park.

Abbott, Nigel Drury Grisley, M.B., B.S., 1944 (Univ. Adelaide), Royal Adelaide Hospital, Adelaide.

Schroeder, Arthur George, M.R.C.S. (England), L.R.C.P. (London), 1925, D.T.M. (Sydney), 91A, Park Terrace, North Unley.

Matthews, Maurice John, M.B., B.S., 1944 (Univ. Adelaide), 67, Hall Street, Semaphore.

Hamilton, William Murray, M.B., B.S., 1944 (Univ. Adelaide), 4, Portrush Road, Marryatville.

Coates, John Richard, M.B., B.S., 1944 (Univ. Adelaide), 2, Edith Street, Gawler.

Parton, Arthur Leigh, M.B., B.S., 1944 (Univ. Adelaide), 15, Esplanade, Glenelg.

Obituary.

ROY ARNOLD LOVEJOY.

WE regret to announce the death of Dr. Roy Arnold Lovejoy, which occurred on January 30, 1945, at Liverpool, New South Wales.

Notice.

THE AUSTRALIAN SOCIETY OF ANÆSTHETISTS.

A MEETING of the Australian Society of Anæsthetists will be held at the Royal Australasian College of Surgeons, Spring Street, Melbourne, on Wednesday, February 28, 1945, at 10 o'clock a.m. All members of the British Medical Association are invited to be present.

The annual cricket match for the B.M.A.-A.D.A. Shield will be played at the Sydney Cricket Ground on Wednesday, February 21, 1945. Medical practitioners wishing to play should communicate immediately with Dr. W. L. Calov, 147, Macquarie Street, Sydney. Telephone: BW 7208.

Medical Appointments.

His Excellency the Governor in Council has been pleased to appoint the undermentioned medical practitioners to be honorary clinical assistants at the Royal Adelaide Hospital: *Medical Section:* Reginald Nevill Cudmore Bickford, Josiah Mark Bonnin, Karl Francis Edwards, Alan Henry Finger, Ernest Flaum, Oswald Bertram Lower, Ivan Sandilands Magarey, Malcolm William Miller, John Meavious Pedler, Cyril Thomas Piper, Christopher Bagot Sangster, Frederick Gordon Trevor Turner, Robert Frank West. *Surgical Section:* Noel James Bonnin, Joseph Ruskin Cornish, Garton Maxwell Hone, Thomas David Kelly, Sydney Krantz, Bruce Ernest Lawrence, James Davidson Mill, Owen Meredith Moulden, Neill Horace Munday, Alistair Campbell McEachern, Douglas Gordon McKay, Leonard James Ternouth Pellew, George Herbert Solomon, John Love Steele Scott, Wallace Wilson Jolly, Alan Hubert White. *Vaccine and Asthma Clinic:* John Edwin Bateman. *Physiology Department:* James David Fotheringham, David Wickham Shepherd. *Dermatological Section:* Leslie Wadmore Linn, William Gillfillan, Andrew John Hakendorf, Carl Hannaford Schafer. *Radium Section:* Bertram Speakman Hanson. *X-Ray Section:* Bronte Creagh Smeaton, Bertram Speakman Hanson. *Ophthalmological Section:* Thomas Leslie McLarty, Samuel Pearlman, Vincent Malcolm Putland. *Orthopaedic Section:* Norman Stannus Gunning. *Neurosurgical Clinic:* Thomas David Kelly. *Gynaecological Section:* Henry Edward Pellew, Gerald Jenkin Gregerson, Harry Fenwick Hustler.

His Excellency the Governor in Council has been pleased to appoint Hugh McIntyre Birch, M.R.C.S., L.R.C.P., to be Acting Director-General of Medical Services, Acting Chairman of the Board, Royal Adelaide Hospital, and Deputy Director-General of Medical Services, under the provisions of the *Mental Defectives Act, 1935-1939*, during the absence on leave of the Director-General of Medical Services.

Dr. Walter Bartlett Chapman has been appointed Acting Government Medical Officer at Townsville, Queensland.

Books Received.

"The 1944 Year Book of Radiology"; Section on Diagnosis edited by Charles A. Waters, M.D.; associate editor, Whitmer R. Floror, M.D.; Section on Therapeutics edited by Ira I. Kaplan, B.Sc., M.D.; 1944. Chicago: The Year Book Publishers, Incorporated. 9" x 6", pp. 448, with many illustrations. Price: 37s. 6d.

"The Sick African: A Clinical Study", by Michael Gelfand, M.B., Ch.B., M.R.C.P., D.M.R.; with a foreword by A. P. Martin, M.D., D.P.H., D.T.M. and H.; 1944. Cape Town: The Post-Graduate Press, in association with The Stewart Printing Co. (Pty.) Ltd. 8½" x 5½", pp. 383, with 129 illustrations. Price: 25s.

Diary for the Month.

- FEB. 13.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
FEB. 19.—Victorian Branch, B.M.A.: Hospital Subcommittee.
FEB. 19.—Victorian Branch, B.M.A.: Finance, House and Library Subcommittee.
FEB. 20.—New South Wales Branch, B.M.A.: Medical Politics Committee.
FEB. 20.—Victorian Branch, B.M.A.: Organization Subcommittee.
FEB. 22.—Victorian Branch, B.M.A.: Executive Meeting.
FEB. 23.—Queensland Branch, B.M.A.: Council Meeting.
FEB. 27.—New South Wales Branch, B.M.A.: Ethics Committee.
FEB. 28.—Victorian Branch, B.M.A.: Council Meeting.
MAR. 1.—New South Wales Branch, B.M.A.: Special Groups Committee.
MAR. 1.—South Australian Branch, B.M.A.: Council Meeting.
MAR. 2.—Queensland Branch, B.M.A.: Branch Meeting.
MAR. 6.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
MAR. 6.—New South Wales Branch, B.M.A.: Organization and Science Committee.
MAR. 7.—Western Australian Branch, B.M.A.: Council Meeting.
MAR. 7.—Victorian Branch, B.M.A.: Branch Meeting.
MAR. 9.—Queensland Branch, B.M.A.: Council Meeting.
MAR. 12.—Federal Council, B.M.A. in Australia: Meeting in Melbourne.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain and District United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phoenix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such a notification is received within one month.

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